## ESSENTIAL NEWBORN CARE

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Nursing professionals form the huge work force in delivery of health care in general and newborn care in particular. In order to provide need based care to the newborn and infant at all levels of care they need to be trained and retrained to update their knowledge and skills to provide effective care to the newborn. This Block on Essential Newborn Care will strengthen their skills in identifying the impact of neonatal care and make appropriate nursing interventions to prevent mortality and mobility, identify deviations and make appropriate referrals. This block consists of four units as given below:

Unit 1 Deals with Care of the Baby at Birth;
Unit 2 Focusses on Postnatal Care of Normal Newborn;
Unit 3 Details out Thermal Protection and Kangaroo Mother Care; and
Unit 4 Describes Breast Feeding and Lactation Management.
UNIT 1 CARE OF THE BABY AT BIRTH

Structure

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1.1 Introduction
1.2 Immediate Care at Birth
1.3 Care After Delivery
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   1.3.2 Provision of Warmth
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1.6 Bag and Mask Ventilation and Endotracheal Intubation
1.7 Maintaining Circulation – Chest Compression
1.8 Administration of Medication
1.9 Precaution during Resuscitation
1.10 Let Us Sum Up
1.11 Glossary
1.12 Answers to Check Your Progress

1.0 OBJECTIVES

After completion of this unit you should be able to perform the following for the newborn:

- Provide care to newborn at birth;
- Maintain warmth;
- Establish breathing;
- Assess the birth weight;
- Recognize the indications for resuscitation;
- Enumerate the initial steps of resuscitation; and
- Demonstrate the correct technique of i) Bag and Mask ventilation ii) Chest compression and iii) Endotracheal intubation
1.1 INTRODUCTION

As you know that when a baby is born he/she has to adjust from fetal life to extra uterine life. All the body systems undergo some changes during transition from intrauterine environment to extra uterine environment. Newborns are fragile beings thus posing greater challenge to nurses in providing skilled care. The baby must be provided basic essential care to ensure its survival and optimum growth and development. This is only possible by effective nursing care as nurses play critical role in perinatal and neonatal care at various levels of health care facilities. In this unit, we shall focus on immediate care at birth and resuscitation required for asphyxiated baby.

1.2 IMMEDIATE CARE AT BIRTH

Your responsibility is to prepare mother for safe delivery during antenatal care. The room where the delivery takes place should be clean, well ventilated and adequately lighted. You should ensure the following during delivery:

i) Call out the time of birth

It is important to tell loudly the time of birth – this helps in accurate recording of time and more importantly alerts other health personnels in case any help is needed.

ii) Receive the baby on to a warm, clean and dry towel or cloth on a warm dry surface

The baby should be delivered on to a warm clean towel and kept on the mother’s chest. If this is not possible, the baby should be kept in a clean, warm safe place close to the mother.

iii) Clamp and cut the umbilical cord

The umbilical cord should be clamped using a sterile blade about 2-3cm (1-inch) away from the skin.

iv) Immediately dry the baby with a warm clean towel or piece of towel; wipe the eyes

The baby should be thoroughly dried to prevent from getting cold (this would be explained in the unit on Thermal protection). Blood or meconium on the baby’s skin should be wiped away; however, the white greasy substance covering the baby’s body (vernix) should not be wiped off. Because this vernix helps to protect the baby’s skin and gets reabsorbed very quickly.

v) Assess the baby’s breathing while drying

At the time of drying itself, the baby’s breathing should be assessed. A normal newborn should be crying vigorously or breathing regularly at a rate 40-60 breath per minute. If the baby is not well, then the steps of resuscitation have to be carried out.

vi) Wipe both the eyes with sterile gauze/cotton

Clean the eyes using sterile gauze/cotton. Use separate gauze/cotton for each eye. Wipe from the medial side (inner canthus) to the lateral side (outer canthus).
vii) Leave the baby between the mother’s breasts to start skin-to-skin care

Once the cord is cut, the baby should be placed between the mother’s breasts to initiate skin-to-skin care. This will help in maintaining the normal temperature of the body as well as in promoting early breastfeeding.

viii) Place an identity label on the baby

This helps in easy identification of the baby, avoiding any confusion. The label should be placed on the wrist and ankle.

ix) Cover the baby’s head with a cap. Cover the mother and baby with a warm cloth

Both the mother and the baby should be covered with a cloth, especially if the delivery room is cold (temperature less than 25°C). Since head is the major contributor to the surface area of the body, a newborn baby’s head should be covered with a cap to prevent loss of heat.

x) Encourage mother to initiate exclusive breastfeeding

Breastfeeding should be initiated within half an hour of birth in all babies.

1.3 CARE AFTER DELIVERY

1.3.1 Initial Examination

Conduct quick clinical screening to identify any life threatening congenital anomalies and birth injuries like esophageal atresia, congenital diaphragmatic hernia etc. (Details of initial examination are discussed in unit 2, Block 2)

1.3.2 Provision of Warmth

At the time of delivery ensure the delivery room is warm, this means that the temperature of room where delivery is conducted should be 25°C, with no draughts. Dry the baby immediately, remove wet cloth, wrap the baby with clean dry cloth. Keep the baby close to the mother (ideally skin to skin) to stimulate early breastfeeding. Postpone bathing for 6 or more hours till the baby stabilizes.

After delivery: Keep the baby clothed with the head, hands and feet covered. Minimize bathing, especially in cool weather or for small babies. Keep the baby close to the mother. The room should also be kept warm. Use Kangaroo Care to stabilize LBW babies or for rewarming stable bigger babies. Show the mother how to avoid hypothermia, how to recognize it, and how to rewar...
1.3.4 Assessment of Birth Weight

Weight should be recorded preferably within first hour of birth but not later than 24 hours. When the weight is taken later than 24 hours then the weight should be recorded along with age of the baby. The purposes for assessing birth weight are as follows:

- Identify LBW baby and anticipate problems associated with it.
- Have a reference value for monitoring growth.
- Calculate drug doses and volume of fluid to be given to the baby, if necessary.
- Assess the adequacy of feed and fluid intake.

Management of the newborn based on birth weight is indicated in the Table 1.1:

<table>
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<th>Where to manage</th>
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<td>More than 2500gm</td>
<td>Home</td>
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<tr>
<td>2000 to 2500gm</td>
<td>Home</td>
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<tr>
<td>Less than 2000 gm</td>
<td>Referral</td>
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Newborns with birth weight above 1800 gm or more and gestational maturity of 35 weeks or more apparently appearing healthy can be managed at home. Consideration may also be given to family support system and environmental conditions at home. Newborns including low birth weight infants who show any signs of illness must be referred to an institution which has facilities for newborn care.

1.3.5 Prevention of Neonatal Infection

We should talk about cord care first and then focus on skin and eye care.

Cord Care

You should cut the cord with a clean instrument (i.e. razor or blade). Tie the cord tightly with clean thread or use a cord clamp. Keep the cord clean and dry and wash hands before touching it. Tie napkin or diaper below the cord stump. Observe the cord for bleeding after birth. Observe for pus discharge from the cord stump, redness around the cord especially if there is swelling and high temperature (more than 38 degree centigrade) or other signs of infection.

| Bandages should not be used because it may delay healing and introduce infection. Don’t use alcohol cleansing agents, it may delay healing. Do not apply traditional remedies to the cord, it may cause infections and tetanus. |

Skin Care

You should leave vernix on the skin while drying the baby. Change diapers soon after they are wet or dirty. Give bath daily in summer months. Ensure that caregivers wash their hands before handling the baby. Observe for pustules especially in axilla, groin and neck and other signs of severe infection such as fever and poor feeding.
Eye Care

Clean eyes immediately after birth with swab soaked in sterile water using separate swab for each eye. Clean eyes from medial to lateral side. Instill prophylactic eye drops or ointment within 1 hour of birth as per hospital policy. This is done specially in the areas where sexually transmitted diseases are common and can be passed on to the baby during the birth process and can result in blindness. Observe eyes for any discharge, redness and swelling around the eyes.

Don’t put anything in baby’s eyes such as surma or kajal

Observe Six Cleans

You should maintain clean chain to prevent neonatal infection. Clean chain means observing principles of cleanliness throughout the labour, delivery and birth until the separation of the cord stump. The six cleans recommended by WHO are as follows:

At Delivery

i) Clean attendants hands (washed with soap and water)
ii) Clean delivery surface
iii) Clean cord cutting instrument (i.e. razor and blade)
iv) Clean string to tie cord
v) Clean cloth to wrap the baby
vi) Clean cloth to wrap the mother (A clean birth kit may help to promote clean deliveries)

After delivery

You must wash hands before and after handling the baby and advice to all caregivers to:

• Wash hands before handling the baby
• Feed only breast milk
• Keep the cord clean and dry
• Use a clean cloth as a diaper/napkin
• Wash your hands after changing diaper/napkin.

1.3.6 Breast Feeding

Early breast feeding – Breast feeding should be started within the first hour after birth and mother should be prepared physically and emotionally in antenatal period for early breastfeeding. Mother should be helped and supported for correct technique (i.e. positioning, latching and attachment) during breast feeding and lactation management. No pre-lacteal feeds such as glucose water, honey, gur, ghutti, gripe water, animal or powdered milk etc. should be given. Breast feeding gives skin to skin contact which helps the baby to stay warm (Fig. 1.1).
Essential Newborn Care

Remember: After wiping dry and recording weight, the baby should be put to breast in the labour room itself.

Exclusive breast feeding – Encourage exclusive breast feeding for the first 6 months. Colostrum (the first milk) has many benefits, especially anti-infective properties and should be fed to the baby. Breast feeding provides the best possible nutrition for the baby. Mother should feed the baby day and night, at least 8 times in 24 hours, allowing on demand sucking by the baby. If the baby is small (less than 2,500 grams), wake the baby to feed every 3 hours. Successful breast-feeding requires support for the mother from family and health personnel. (For details refer unit-2, i.e. Postnatal Care of Normal Newborn).

Exclusive breast-feeding will save the lives of many babies by preventing malnutrition and infections like diarrhoea and pneumonia etc.

Ensure exclusive breast-feeding during first 6 months of life. Additional water is not necessary even in summer. Breast-feeding should be continued during diarrhoea as well as other illness. It helps the baby to get optimal nutrition and recover from the illness faster.

Check Your Progress 1

1) Mention six cleans during delivery.
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Fig. 1.1: Breastfeeding the baby
You have already learnt care of new born at birth. Now we shall discuss about neonatal resuscitation.

### 1.4 RESUSCITATION OF AN ASPHYXIATED NEW BORN

Resuscitation means restoration of life. It is revival from apparent death. Oxygen is important for every part of the human body. Without oxygen the cells that make up our organs, brain and other body parts will die. During pregnancy baby receives oxygen from his mother through the placenta. After the baby is born, the baby starts to use his own lungs to get the oxygen needed. For most babies this change happens without any problem. But some babies need help to start or continue breathing.

The skill of newborn resuscitation will help you to establish independent breathing of baby and also will save the life of baby. About 5% - 10% of newborns need resuscitation. Nearly 1 million newborns die because of asphyxia (difficulty in breathing due to lack of oxygen). Therefore, many babies can be saved with active or vigorous resuscitation.

As a nurse you need to recognize breathing problems of a newborn and use resuscitation skills when needed. The major problem common in this period is Asphyxia which requires immediate resuscitation. Let us begin our discussion with Birth Asphyxia.
1.4.1 Definition and Physiology of Asphyxia

Asphyxia is failure of the baby to breathe spontaneously at birth. Asphyxia can start before or after the baby is born. If the baby has asphyxia, the baby will have trouble in breathing (gasping or breathing very irregularly or no breathing). The baby’s colour will be pale or blue. This is when the skill of newborn resuscitation can save the life of the newborn.

Asphyxia can also happen in the womb when there is pressure on the umbilical cord resulting in less blood flow through the cord to the baby. When a baby has asphyxia you must start resuscitation immediately.

Pathophysiology of Asphyxia: Birth asphyxia is associated with reduction in arterial oxygen tension, accumulation of carbon dioxide and fall in blood pH. These biochemical and physiochemical changes eventually lead to “right to left shunt” causing asphyxia to continue.

During the early phase of birth asphyxia, the blood glucose level is significantly elevated due to the breakdown of glycogen to glucose, while severe and prolonged hypoxia in preterm and growth retarded babies is associated with hypoglycemia. Hypothermia and hypoglycemia lead to accumulation of nonesterified free fatty acid and glycerol. Anoxic damage to cells leads to failure of energy-dependent sodium pump mechanism with release of potassium and phosphates into the extra cellular fluid.

1.4.2 Factors Indicating the Need for Resuscitation

At birth the newborn may become asphyxiated suddenly, but in many cases the birth of an asphyxiated baby can be anticipated. Proper assessment should be done by history taking and examination for the presence of some ante-partum and intrapartum risk factors which helps to anticipate resuscitation and effectively manage the asphyxiated baby.

You have to remember that resuscitation must be anticipated at every birth. Every birth attendant should be prepared and be able to resuscitate the baby when it is necessary. Delay in initiation of resuscitation results in damage to vital organs leading to permanent handicapped conditions and death.

Following are the factors which indicate the need for resuscitation:

- **Mother:** Pregnancy Induced Hypertension (PIH), Bleeding (placenta previa or abruptio placentae), Prolonged or obstructed labor, fever in labor, post-term pregnancy (after 42 weeks pregnancy).
- **Umbilical cord:** Cord around the baby’s neck, short cord, knot in the cord, prolapsed cord.
- **During or after birth:** Premature baby, difficult delivery (breech, multiple birth, stuck shoulders, vacuum extraction, forceps), congenital or genetic anomalies, meconium in the amniotic fluid, mother had drugs given for pain or sedation very close to the time of birth (can make baby too sleepy to breathe), baby has too much fluid in its mouth and throat.

Remember that presence of any of these factors indicates that the neonates are at risk of asphyxia and they may need resuscitation. But they may not have problems immediately after delivery, so they need careful monitoring during first 24 hours of life.
1.4.3 Evaluation of signs for Resuscitation

Neonates condition is to be evaluated at birth to take immediate decision and necessary action. The useful criteria to guide neonatal resuscitation are respiration, heart rate and colour.

The traditional Apgar scoring system is not useful for decision making to initiate the resuscitation as it is done in 1 minute, so it could delay the course of resuscitation. First one minute after birth is very crucial. Apgar score is useful for evaluation of effectiveness of resuscitation at 5 minutes. Apnea of intrauterine life may continue after birth and delay in resuscitation can lead to irreversible brain damage. So at birth, quick evaluation of respiration, heart rate and colour helps to make decision for necessary action of resuscitation and to do the action immediately. (Evaluation- Decision- Action- Evaluation).

TABC of Resuscitation:

The resuscitation of newborn is done to restore life by patent airway, effective breathing and providing adequate circulation. Thermoregulation is initial and important component of neonatal resuscitation. So the elements of neonatal resuscitation are considered as TABC.

T Temperature Maintenance
A Airway clearance
B Breathing initiation
C Circulation

To achieve all these, following steps are to be done:

T : Temperature maintenance for thermoregulation:
- Drying the baby.
- Removing and discarding wet linen.
- Wrapping the baby in another pre-warmed clothing or towel (whole body including head).
- Using radiant heat source to keep the baby warm.

A : Airway clearance to ensure patent airway
- Position the baby supine or side lying with slight extension of neck. Use shoulder roll ¾ or one inch size to extend the neck. Suction the nose first, then mouth.
- If the baby is not breathing or having slow effort for breathing provide tactile stimulation. Stimulation can be provided with one to two flicks on the sole of the feet. If still the baby is not breathing, thoroughly suck the oral cavity glottic area under direct vision of laryngoscope and put endotracheal tube. You may attach the endotracheal tube to gentle intermittent suction. Evaluate the baby after every 30 sec to decide further action.

B : Breathing initiation to provide effective oxygenation by
- Using tactile stimulation.
- Giving Free Flow oxygen (100 %).
- Giving positive pressure ventilation (PPV) with bag and mask or with bag and ET, when the heart rate is less than 100/min.
C: Circulation maintenance to provide oxygenated blood supply to vital organs by

- Giving chest compressions, when the HR < 60 bpm despite effective ventilation.
- Administering medication.

Check Your Progress 2

1) Define asphyxia.

2) List down the factors indicating need for resuscitation.

3) Mention the criteria to be evaluated to guide neonatal resuscitation.

4) What is TABC of neonatal resuscitation?

1.5 INITIAL STEPS

Initial steps of neonatal resuscitation are – preventing heat loss, positioning, suctioning, evaluation of the baby’s condition, tactile stimulation and administering free flow oxygen. If the neonate does not respond with these measures, further steps are to be followed. These steps are bag & mask ventilation, chest compressions and endo-tracheal intubation and administration of medication.

Anticipating the need for resuscitation, adequate preparation, timely recognition and quick and correct action is essential for effective resuscitation.

The resuscitation of newborn is done to restore life by patent airway, effective breathing and providing for adequate circulation.

Follow the steps of resuscitation as under (Ref. Fig. 1.2):
- Note the time of birth
- Receive baby in dry warm linen
- Is baby breathing or crying?
- “YES” or “NO”

Assess the baby as per questions given in Fig. 1.2

If answer is “Yes” provide routine care.

If the answer is “No” to any of these questions, begin initial steps of resuscitation. Provide initial care, provide warmth, provide correct position, clear airway (as necessary), dry, stimulate, reposition and give $O_2$ (as necessary).

**Fig. 1.2: Initial Steps in Resusciation**

**Initial steps**
- Cut cord immediately and place under radiant warmer (skin-to-skin care with mother)
- Provide initial steps (Dry, position, clear airway, tactile stimulus)

**Routine Care**
- Dry baby on mother’s abdomen
- Provide warmth (skin-to-skin care with mother)
- Assure open airway if needed
- Cut cord in 1-2 min
- Ongoing evaluation of neonate

**Remember**
- Most of the newborns cry spontaneously after birth and suction of the mouth and throat is not necessary.
- Do not use gauze or cloth to clear secretions.

**1.5.1 Provide Warmth/Maintaining Temperature**

To avoid the metabolic problems brought on by cold stress, an important step in the care of the newborn is to prevent the loss of body heat. This can be especially critical in a newborn that needs resuscitation. Even healthy term infants have a limited ability to produce heat when exposed to a cold environment, particularly during the first 12 hours of life.

Following steps are undertaken for preventing heat loss:
• **Drying the infant**

As soon as an infant is placed under the radiant warmer, the body and head should be quickly dried to remove amniotic fluid and to prevent evaporative heat loss (Fig. 1.3a). It is preferable to dry the infant with a prewarmed towel or blanket. The next step is to remove the wet towel or blanket from the infant. After removing the wet linen, heat loss can be reduced even further by laying the infant on another prewarmed towel or blanket (Fig.1.3b).

![Fig. 1.3: (a) Dry Quickly and Thoroughly](image)

![Fig. 1.3: (b) Dress Warmly](image)

• **Using a radiant heat source/ other means to keep infant warm**

An overhead radiant heater provides a suitable thermal environment that minimizes radiant heat loss. It is important to switch on the radiant warmer so that the infant is placed on a warm mattress. A radiant warmer allows easy access to the baby and provides full visualization of the infant. Earlier, use of blankets and clothing used to cover the infant limited the ability to observe him or her. Therefore, radiant warmer is preferred.

If radiant heat source is not available, a lamp with 200 W bulbs or a suitably fixed room heater can also be used (Fig. 1.4).

![Fig.1.4: Radiant Warmer](image)

1.5.2 **Ensuring Clear Airway**

The following steps need to be under taken to establish open and patent airway:
Positioning:

The neonate should be placed on his or her back or side with the neck slightly extended, head towards the health provider assisting delivery. Care should be taken to prevent hyperextension or under flexion of the neck since either may decrease air entry. To help maintain the correct position, you may place a rolled blanket or towel under the shoulders, elevating them 3/4 to 1 inch. If the infant has copious secretions coming from the mouth, you may turn the head to the side. This will allow secretions to collect in the mouth, from where they can be easily removed (Fig. 1.5).

Suctioning

If no meconium is present, the mouth and nose should be suctioned. The mouth is suctioned first to prevent aspiration which can happen if nose is suctioned first (Remember ‘M’ comes before ‘N’). A mucus aspirator (trap) or mechanical suction can be used to remove secretions. Be careful not to be too vigorous as you suction and do not insert catheter deep in the mouth. Stimulation of the posterior pharynx during the first few minutes after birth can produce a vagal response, causing severe bradycardia or apnea. If bradycardia occurs stop suctioning and re-evaluate heart rate.

For suctioning, the size of suction catheter should be 10 F. The suction pressure should be set so that when the suction tubing is occluded, the negative pressure does not exceed 100 mm Hg (130 cm water) and is generally kept around 80 mm Hg (100 cm water).

If meconium is present, use 12F or 14 F catheters for oral suction before the delivery of shoulder at table. Nonvigorous baby will need tracheal suction (skilled professional help is required). DO NOT DRY THE BABY, JUST WRAP IN PREWARmed CLOTHES.

Evaluation

The infant should be evaluated on the basis of three vital signs:

1) **Respiration:** Observe and evaluate the infant’s respiration by observing the chest movement.
   - If breathing is spontaneous, go on to check the heart rate. If breathing is not spontaneous begin tactile stimulation (Refer subsection 1.5.3). If still no spontaneous respiration, start PPV (Positive Pressure Ventilation).
Breathing is classified as SPONTANEOUS if baby is crying or has regular, effective respirations.

2) **Heart rate:** This is done by auscultating the heart or by palpating the umbilical pulsations for 6 seconds. Whatever the number of beats/pulsations, it is multiplied by 10 to obtain the heart rate per minute. (e.g. a count of 12 in 6 seconds is a HR of 120/min).
   - If more than 100 beat per minute, look for color. If not, initiate PPV.

3) **Colour:** If the infant is breathing spontaneously and the heart rate is more than 100 beats per minute, evaluate the infant’s color by looking for cyanosis at lips/tongue (central).
   - If central cyanosis is present, administer oxygen.

### 1.5.3 Providing Effective Breathing

The babies who have not cried by the previous measures need the following steps:

**Providing tactile stimulation (Fig. 1.6):**

Both drying and suctioning the infant produce stimulation, which for many babies is enough to induce respirations.

However, if the infant does not have adequate respirations, additional tactile stimulation may be briefly provided to stimulate breathing. If you choose to provide tactile stimulation, free-flow oxygen should be given along with stimulating the infant. There are two safe and appropriate methods of providing additional tactile stimulation:

- One or two slaps or flicks to the soles of the feet or rubbing the back once or twice will usually stimulate breathing in an infant with apnea. However, if the infant remains apneic, tactile stimulation should be abandoned and bag and mask ventilation initiated immediately.
- Continuous use of tactile stimulation in an infant who does not respond is not warranted and may be harmful, since valuable time is being wasted.

![Fig.1.6: Tactile Stimulation](image)

**Harmful ways of stimulation**

- Slapping in back.
- Squeezing the rib cage.
- Forcing thigh on abdomen
- Using hot or cold compress.
- Shaking
Using free-flow oxygen:

Free flow of oxygen is used when an infant has established regular respirations and the heart rate is greater than 100 beats per minute but central cyanosis persists. In these circumstances, free-flow 100% oxygen at 5 L/min is given. Once the infant becomes pink, the oxygen should be gradually withdrawn. Observe the infant till he can remain pink while breathing room air. If cyanosis persists despite 100% free-flow oxygen, a trial of bag and mask ventilation may be indicated (Fig. 1.7).

![Fig. 1.7: Free Flow Oxygen Delivery Methods](image)

Free flow of oxygen is indicated for central cyanosis. This can be provided by

- Oxygen mask held over the baby’s face.
- Oxygen tubing cupped closely over the baby’s mouth and nose.

Remember promptness and skills both are equally important. These initial steps should be done in not more than 20 to 30 seconds.

1.6 BAG AND MASK VENTILATION AND ENDOTRACHEAL INTUBATION

Indication for bag and mask ventilation are – the baby is apneic or gasping and with spontaneous respiration but heart rate is below 100 beats/minute, despite positioning, suctioning and tactile stimulation. So before starting the PPV with bag and mask, baby’s condition is to be evaluated and decision to be taken on the basis of baby’s respiration, heart rate, and colour for the further necessary actions of resuscitation.

For this you will require self-inflating bag, baby mask, oxygen source, suction apparatus, intubation apparatus, etc.

It is important that you become completely familiar with the specific equipment used where you work.
**Resuscitation masks**

Masks are available in a variety of shapes, sizes and materials. Resuscitation masks should have cushioned rim for better seal. The rim conforms more easily to the shape of the infant’s face, making it easier to form a seal. It requires less pressure on the infant’s face to obtain a seal. There is less chance of damaging the infant’s eyes if the mask is correctly positioned. For the mask to be of correct size, the rim will cover tip of the chin, the mouth and the nose but not the eyes.

![Fig. 1.8: Fitting mask over face](image)

The mask should tightly fit on the face enclosing nose and mouth of the baby. The oxygen reservoir should be attached to the bag to increase the concentration of oxygen delivered to the baby. The infant should be ventilated at a rate of **40 to 60 per minute**. There should be noticeable rise and fall of the chest during each ventilation. Naloxone 0.1 ml /kg should be administered intravenously through umbilical vein if mother has received pethedine or morphine within 4 hours before delivery. During bag and mask ventilation, heart rate should be closely monitored after every 20 to 30 seconds. To save time, heart rate is counted for 6 seconds and multiplied by 10 to get the rate per minute. If despite bag and mask ventilation, heart rate is below 100 per minute, the infant should be intubated.

Remember: Bag-mask ventilation may be attempted in the spontaneously breathing infant who remains cyanotic despite administration of 100% free-flow oxygen.

In diaphragmatic hernia, bag and mask ventilation is contraindicated. In meconium stained non-vigorous baby bag and mask ventilation is carried out after tracheal suction.

**Endotracheal intubation:**

Endotracheal (ET) intubation is required in only a small proportion of asphyxiated neonates. Intubation is a relatively more difficult skill to master and it requires frequent practice to maintain this skill. Nurse usually assists during this procedure. Endotracheal intubation is indicated if bag and mask ventilation fails to maintain adequate ventilation as evidenced by persistent bradycardia (heart rate below 100 per minute). Infants with diaphragmatic hernia and thickly meconium stained babies are electively intubated because bag and mask ventilation is contraindicated in these situation. For details refer practical 1, Block 1 (Fig.1.9).
1.7 MAINTAINING CIRCULATION–CHEST COMPRESSION

Blood circulation needs to be maintained for delivery of oxygen to vital organs. In a hypoxic baby, heart rate slows down and there is diminished blood flow to vital organs which can lead to irreversible damage to brain, heart, and kidneys etc. So measures should be taken to maintain circulation in asphyxiated baby. This is done mainly by chest compressions.

Chest compression:

It is rhythmic compression of the sternum to compress the heart against the spine and to increase intrathoracic pressure, thus to circulate blood to the vital organs. Chest compressions are used to temporarily increase circulation and oxygen delivery. Chest compressions must always be accompanied by ventilation with 100% oxygen. Ventilation must be performed to ensure that the blood being circulated during chest compressions gets oxygenated (Fig. 1.10).
Indications of chest compressions: When heart rate is below 60 beats/ min or between 60 to 100 beats/ min and not increasing after 15-30 secs of positive pressure ventilation with 100 percent oxygen. Once heart rate is below 80 beats/ min, chest compression should be started.

Position of the baby for chest compression should be like ventilation, with neck slightly extended and the back must have firm support, so that heart can be compressed between sternum and spine.

Techniques of chest compressions: There are two techniques of chest compression: i) thumb technique and ii) two finger technique. Thumb technique is more preferable but other is also acceptable. In thumb technique, the balls of the thumb are used for compression, with the hands encircling the torso of the baby and fingers supporting the back. In two finger method, the tips of middle finger of one hand are used to depress the sternum. The other hand is used to support the back (Fig. 1.11).

![Techniques of chest Compression](image)

(a) Two Finger Method
(b) Thumb Method

Fig. 1.11: Techniques of chest Compression

The location, depth and rate of compressions are same for both methods.

Location for application of pressure during chest compression is lower third of the sternum. Pressure on xiphoid process should be avoided. To locate the area of lower third of sternum, draw an imaginary line between two nipples, the lower part of the sternum is just below this line.
Pressure to depress the sternum during chest compressions should be to a depth of ½ - ¾ inches. Pressure should be applied by the correctly placed fingers and hands. Pressure should be released between two compressions to allow the heart to refill (Fig. 1.12).

![Location of Compression](image)

**Fig. 1.12: Location of Compression**

**Rate** of chest compression should be 120 times per minute; PPV should be given during chest compression. Ventilation should follow every third compression. In one minute 90 chest compressions and 30 PPVs are given, the total of 120 events, (3:1 ratio). So, in 2 seconds cycle, three compression in 1.5 seconds and 0.5 sec.of ventilation are given (two persons must work in coordination during chest compressions and ventilation).

### Check Your Progress 3

1) Explain the steps to be practiced for maintenance of temperature of a neonate.

2) What position of the baby will you maintain to ensure open airway?
3) What will you suction first? Mouth or nose of the baby and why?
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.............................................................................................................
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.............................................................................................................
4) List the correct and safe methods of tactile stimulation.
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5) How the free flow oxygen can be administered?
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.............................................................................................................
6) Write the indications of bag and mask ventilation.
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7) When does a neonate need endotracheal intubation?
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.............................................................................................................
.............................................................................................................
.............................................................................................................
.............................................................................................................
8) What are the indications of chest compression?

9) What techniques are used for chest compression?

10) Name the part where you will give pressure during chest compressions. How will you locate the area?

Remember: Throughout the steps of resuscitation, assess the newborn for cry, breathing effort, heart and colour.

### 1.8 ADMINISTRATION OF MEDICATION

Now we shall learn about administration of medication to neonate. If the neonate fails to improve after giving positive pressure ventilation and chest compressions then medication should be administered. Only few neonates require medication. Usually majority of the neonates have good response to PPV with 100% Oxygen and additional chest compression.

The indications for Epinephrine are heart rate below 80 beats/minute after adequate ventilation with 100% Oxygen and chest compression for minimum of 30 sec and in the baby with heart rate of zero.

The route of administration of medications is mainly umbilical vein via catheter. The veins of scalp and extremities are difficult to access in neonate. The intra-cardiac injections are not recommended in the neonates. Direct injection in to the umbilical cord should not be attempted as it is not a desirable route for the neonates. Some medications may be given directly into the bronchial tree through endotracheal tube which should be flushed with 0.5 ml of normal saline followed by positive pressure ventilation.
When medications are indicated, they should be given promptly, and at the same time PPV and chest compressions should also continue. Table 1.2 & Table 1.3 discusses the medicines in resuscitation.

**Table 1.2: Medications, Indications and Effects**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Indication</th>
<th>Effects</th>
<th>Response</th>
<th>Follow up if no Response</th>
</tr>
</thead>
</table>
| Epinephrine | HR zero or below 80/ min after 30 sec of PPV & CC. | Inotrophic, Chronotrophic, peripheral vasoconstrictor. | HR 100 or above after 30 sec. | If HR below 100,  
- Repeat epinephrine every 5 minutes.  
- Consider high dose (10 times) of epinephrine.  
- Consider volume expander or sodium bi-carbonate. |

| Volume expanders (Normal saline, Ringer’s lactate, albumin) | Acute bleeding with signs of hypovolemia. | Increase intra vascular volume, cause better tissue perfusion, and lower acidosis. | Better pulses, higher BP, improve pallor. | If hypovolemia persists repeat volume expander. Consider sodium bi-carbonate/dopamine. |

**Table 1.3: Medication Dosages**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Conc. Available in India</th>
<th>Conc.to be administered</th>
<th>Route</th>
<th>Amount to dilute &amp; Prepare</th>
<th>Dose of the prepared solution</th>
<th>Usual range of dose (1-3 kg body)</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epinephrine</td>
<td>1:1000</td>
<td>1:10,000 (i.e. diluted in 10)</td>
<td>IV, IT.</td>
<td>0.5ml in 5 ml. 1.0 ml in 10 ml.</td>
<td>0.1 ml/kg to 0.3 ml/kg. 0.2 ml/kg to 0.6 ml/kg.</td>
<td>¼ ml to 1 ml. ½ ml to 2 ml.</td>
<td>Rapid</td>
</tr>
<tr>
<td>Volume expanders (Normal saline, Ringer’s lactate, albumin)</td>
<td></td>
<td></td>
<td>IV</td>
<td>40 ml in infusion set or multiple syringes.</td>
<td>10 ml/kg</td>
<td>10 to 20 ml</td>
<td>5 to 20 minutes</td>
</tr>
</tbody>
</table>

1.9 **PRECAUTION DURING RESUSCITATION**

Precaution should be taken to avoid adverse effects and complications during resuscitation. The following measures are to be followed:

a) Never delay in evaluating the baby’s condition at birth. Assess for respiration, heart rate and colour immediately.

b) Remember, first few breaths require 2 to 3 times the pressure than succeeding breath to remove foetal lung fluid.
c) Anticipate the need for resuscitation and adequate preparation is vital for further action.

d) Maintain asepsis and universal precautions.

e) Every action should be based on evaluation and decision.

f) Follow the principle of successful resuscitation.

g) Never allow the baby to develop hypothermia.

h) Do not keep the baby in head down position for long time.

i) Avoid vigorous and continuous suctioning.

j) Refrain from harmful practices during tactile stimulation.

k) Never use full palmer grasp for giving bag & mask ventilation.

l) Do not blow your lungs into baby’s mouth.

m) Call for assistant whenever you need or in difficulty.

n) Be consistent in compressing the chest for rate and depth.

o) Stop the unsuccessful attempts of intubation immediately, stabilize the baby with PPV and then re-attempt.

p) Don’t leave an open endotracheal tube in place.

q) Never give sodium bicarbonate till the ventilation is established. It must also be followed with ventilation. Epinephrine and volume expanders should be given before sodium bicarb injection.

r) Remember, the treatment of metabolic acidosis is oxygenation and volume expansion and not sodium bicarbonate.

s) Evaluate respiration, heart rate and colour and take decision before initiation of any further action, keep record of all findings and actions.

1.10 LET US SUM UP

In this unit, we have discussed about newborn care at birth and resuscitation of newborn in different aspects. We have focused on provision of warmth, establishment of respiration, initiation of breast feeding, cord, skin and eye care at birth. We have also discussed birth asphyxia, anticipation for resuscitation, evaluation of signs for resuscitation and TABC of resuscitation. We have emphasized on various steps of resuscitation and necessary precautions. As a nurse we have vital role in preventing neonatal mortality by providing necessary immediate care at birth and resuscitating the asphyxiated neonate. This should be performed with skill and competency to save the neonate’s life.

1.11 GLOSSARY

Apnea : It means cessation of breathing.

Colostrum : It is the milk secreted during first week after delivery. It is yellow, thick and contains more antibodies and white blood cells.
**Chest Compressions:** It is rhythmic compression of sternum to compress the heart against the spine to circulate the blood to the vital organs and to the whole body.

**Positive pressure ventilation:** It is a mechanical method of assisting pulmonary ventilation employing a device that administers oxygen or air for the inflation of the lungs under positive pressure. Exhalation is usually passive. PPV can be given intermittent or continuous. It is administered by bag and mask or endotracheal tube.

**Resuscitation:** It means restoration of life and revival from apparent death.

## 1.12 ANSWERS TO CHECK YOUR PROGRESS

### Check Your Progress 1
1) Refer 1.3.5.
2) Refer 1.3.2.
3) Six (6) months.
4) Early breast feeding reduces the risk of post-partum haemorrhage of mother, gives skin to skin contact and helps the baby to stay warm.

### Check Your Progress 2
1) **Asphyxia** is failure of the baby to breathe spontaneously at birth. Asphyxia can start before or after the baby is born. If the baby has asphyxia, the baby will have trouble in breathing (gasping or breathing very irregularly or no breathing). And also the baby’s color will be pale or blue.

2) Refer sub section 1.4.2
3) Respiration, heart rate and colour.
4) T indicates Temperature maintenance.
   A indicates Airway clearance.
   B indicates Breathing initiation.
   C indicates Circulation maintenance.

### Check Your Progress 3
1) Refer sub-section 1.5.1.
2) Baby should lie on back with slight extension of neck.
3) Mouth (Refer subsection 1.5.2).
4) Flicking or slapping the baby’s sole of feet and rubbing the back.
5) Free-flow oxygen can be given by oxygen mask, oxygen tubing or by a cupped hand over baby’s face.
6) When baby in apneic or gasping and if heart rate below 100 beats/min with spontaneous respiration or baby is non vigorous with limp, cyanosis and HR < 100/min.

7) * When positive pressure ventilation is to be continued for prolonged period.
   * When bag & mask ventilation is ineffective, so endotracheal intubation is required.
   * When tracheal suctioning is required due to presence of meconium stained liquor.
   * When diaphragmatic hernia is suspected.

8) When heart rate is below 80 beats/min or between 60 to 100 beats/min and not increasing even after 15 to 30 sec of PPV with 100% oxygen.

9) Thumbs technique and two fingers technique.

10) Lower third of sternum. To locate the area, draw an imaginary line between 2 nipples, lower part of sternum is just below the line.
UNIT 2 POSTNATAL CARE OF NORMAL NEWBORN AND NORMAL VARIATIONS

Structure
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2.2 Levels of Neonatal Care
2.3 Care of Newborn Baby
   2.3.1 Maintenance of Body Temperature
   2.3.2 Breast-feeding
   2.3.3 Skin Care and Baby Bath
   2.3.4 Care of Umbilical Stump
   2.3.5 Care of Eyes
   2.3.6 Weight Record
   2.3.7 Immunization
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   2.3.10 Advice at Discharge
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2.5 Nursing Care of Neonate
2.6 Let Us Sum Up
2.7 Glossary
2.8 Answers to Check Your Progress

2.0 OBJECTIVES

After completing this unit, you should be able to:
• State three levels of newborn care;
• Outline the essential care of newborn;
• Describe the principles of management of ‘normal’ neonate;
• Assess physical and physiological parameters of the normal newborn; and
• Demonstrate nursing care of neonate.

2.1 INTRODUCTION

More than half of the infant deaths occur in newborns (first 28 days of life). Most of these deaths take place in the first week of life due to birth asphyxia,
hypothermia and infections. Babies born with a low birth weight (2500gms) are at a higher risk of dying. Provision of essential care to the newborn at birth and during the neonatal period will have a significant impact on neonatal and infant mortality rate.

In this unit, you will learn about grades of neonatal care, care of normal newborn and assessment of a newborn. Let us start with levels of neonatal care.

### 2.2 LEVELS OF NEONATAL CARE

Neonatal mortality and morbidity is directly related to the birth weight and gestational maturity of the newborn. High risk pregnancies (which are associated with the birth of high risk infant) must be identified during antenatal period and referred to an appropriate center for skill management. Based upon birth weight and gestational age, a three tier system of neonatal care should be carried out. Let us now discuss about three tier system of neonatal care.

**Level I Care**

Over 80 percent of newborn babies require minimal care which can be provided by their mother under supervision of basic health professionals. Neonates weighing above 2000 gm or having gestational maturity of 37 weeks or more belong to this category. The care can be provided at home, sub centre and primary health center level. Basic care at birth, provision of warmth, maintenance of asepsis and promotion of breast feeding are the main components of level I care.

**Level II Care**

Infants weighing between 1500- 2000gm or having gestational maturity of 32-36 weeks need specialized neonatal care supervised by trained nurses and pediatrician. District hospitals, teaching institutions and nursing homes should be equipped to provide intermediate neonatal care. Neonatal intermediate care is needed for about 10 to 15 percent of newborn population and should be available at all hospitals catering to 1000 to 1500 deliveries per year.

**Level III Care**

Intensive neonatal care is required for babies weighing less than 1500gm or those born before 32 weeks of gestation. Apex institutions or regional perinatal centers equipped with centralized oxygen and suction facilities, servo controlled incubators, vital signs and transcutaneous monitors, ventilators and infusion pumps etc. are best suited to provide intensive neonatal care. About 3 to 5 percent of newborn populations qualify for intensive care.

### 2.3 CARE OF NORMAL NEWBORN BABY

Till now we have discussed about newborn care at different levels. Let us now discuss regarding care of normal healthy newborn. It is desirable to keep the normal term babies with their mothers rather than in a separate nursery. Rooming in promotes better emotional bonding between the mother and the baby. The mother can participate in the nursing care of her baby. This increases self-confidence in her and reduces demands on nursing personnel. Cross infection is prevented and breast-feeding is established easily. The baby should be received in a sterile sheet and covered adequately depending upon the environmental temperature.
The baby’s colour, respiration, temperature, and umbilical stump should be checked on arrival in the lying in ward. Skin temperature should be recorded twice a day.

### 2.3.1 Maintenance of Body Temperature

A baby who is small (less than 2.5 kg at birth or born before 37 weeks gestation) needs additional thermal protection and warmth to maintain normal body temperature. These babies become hypothermic very quickly, and rewarming the baby can take a long time. The risk of complications and mortality significantly increases if the thermal environment is not optimal. **The environmental temperature that may feel uncomfortable to an adult may impose serious cold stress to a newborn baby.**

**General principles to maintain the body temperature of newborn:**

- Keep the baby clothed or covered as much as possible at all times, including during procedures (e.g. when establishing an IV line, during resuscitation)
- Clothe the baby and cover the head with a cap or hat. Fig. 2.1(a)
- Wrap the baby in a soft dry cloth and cover with a blanket. Fig. 2.1(b)
- Uncover only parts of the body that need observation or treatment.
- Care for a sick or small baby in a warm room (not less than 25 degree centigrade) that is free of draught.
- Do not place the baby near cold objects, such as a wall or window, even if the baby is in an incubator or under a radiant warmer.
- Do not place the baby directly on a cold surface (e.g. place a cloth or blanket under the baby before placing on a cold bed or examination table), and ensure that hands are warm before handling the baby.
- Keep the baby warm during transfer for diagnostic or treatment procedures. Use warming devices or transfer in skin to skin contact (Refer unit- 3, thermal protection and kangaroo mother care) with the mother or another person.
- Ensure warmth during procedures (e.g. use a radiant warmer).
- Change napkins whenever they are wet.
- If anything wet is applied to the skin (e.g. moistened gauze), ensure that baby is warm.
- Avoid bathing the baby during the first six hours of life or until the baby’s temperature is stable, delay bath for a small baby until at least the second day of life.

![Fig. 2.1: (a) Clothing and covering the baby (b) Wrapping](image-url)

Various methods for warming the baby to maintain body temperature are given in Table 2.1.
**Table 2.1: Methods of warming the baby and maintaining body temperature:**

<table>
<thead>
<tr>
<th>Method</th>
<th>Guidelines for Selection and Use</th>
<th>Advantages</th>
<th>Risks / Disadvantages</th>
</tr>
</thead>
</table>
| **Skin-to-skin contact** | a) Appropriate for all stable babies.  
b) Appropriate for re-warming a baby with moderate hypothermia (32ºC to 36.4ºC) particularly when other methods are not available.  
c) Not appropriate for babies with life threatening problems (sepsis, severe breathing difficulty). | a) Mother can closely monitor baby.  
b) Another person can provide skin-to-skin contact if the mother is unavailable.  
c) Babies usually maintain normal body temperature. |                                                                  |
| **Kangaroo mother care**  | a) Appropriate for stabilized babies weighing 1.5 to 2.5 kg but particularly recommended for continuous care of babies weighing 1.5 to 1.8 kg.  
b) Not appropriate for babies with life threatening problems (sepsis, severe breathing difficulty).  
c) Not appropriate if mother has a serious illness or complication from labour or birth that prevents her from caring for the baby. | a) Mother can closely monitor baby.  
b) Babies usually maintain normal body temperature. | a) Mother may not always be available. |
| **Radiant warmer** (Fig. 2.3) | a) Appropriate for sick babies and babies weighing 1.5 kg or more.  
b) Use to keep baby warm during initial assessment, treatment and procedures and to re-warm a cold baby. | a) Allows observation of baby.  
b) Many procedures can be performed while baby is under warmer. | a) Baby can become hyperthermic if temperature is not monitored.  
b) Baby can become dehydrated.  
c) Warmer is expensive to buy.  
d) Warmer requires reliable source of electricity. |
| **Incubator** | a) Appropriate for continuous care of babies weighing less than 1.5 kg who are not eligible for kangaroo mother care. | a) Maintains constant temperature.  
b) Allows observation of baby.  
c) Oxygen can be easily provided. | a) Baby can become hyperthermic or hypothermic if temperature is not monitored. |
2.3.2 Breast Feeding

Ensure that the baby is fed as soon as possible after birth (within half an hour if possible). Encourage early and exclusive breast-feeding whenever possible. Explain to the mother and her family the benefits of early and exclusive breast-feeding (Fig. 2.4), i.e.
• Breast milk contains the exact nutrients the baby needs and promotes the baby’s development.
• Breast milk is easily digested and efficiently used by the baby’s body.
• Breast milk protects the baby from infections.
• Breast-feeding can be used as a contraceptive method.

Encourage the mother to breast feed the baby on demand, both day and night (8 or more times in 24 hours), for as long as the baby wants. Mother should offer the second breast once the baby releases the first breast on her/his own. Advise the mother that she should not:

• Force the baby to feed.
• Interrupt a feed before the baby is done.
• Use artificial teats or pacifiers.
• Give the baby any other food or drinks (e.g. commercial breast milk substitute, animal milks, local porridges, tea, water, etc.) other than breast milk at least for the first 6 months of life.

Ensure that the mother eats nutritious food and also drinks enough fluids. Ensure that the mother can wash or shower daily but tell her to avoid washing or wiping her nipples before breast feeding. Explain to the mother that most medications she may be given will not harm her baby while she breast feeds, however, if the mother is taking cotrimoxazole or pyrimethamine with sulfadoxine, monitor the baby for jaundice.

Fig. 2.4 Breast feeding the baby

If the mother is HIV positive, advice the mother regarding her feeding options, and respect and support the mother’s choice. Allow the mother to make an informed choice about the breast feeding options for her baby. Explain to the mother that breast feeding carries an increased risk of transmitting HIV to the baby after birth.
Inform the mother about her options for feeding, the advantages, and the risk. The mother can choose to:

- Give replacement feeding if this is acceptable, affordable, feasible, sustainable, and safe. Explain to the mother that replacement feeding often carries a higher risk of infant mortality than breast feeding, especially if it cannot be prepared safely, is not continuously available and affordable to the family, and there are limited facilities and water available for preparation.
- Exclusively breast feed for 6 months and then continue breast feeding while starting complimentary feeding after 6 months of age.

Help the mother to assess her situation. Help her decide whether to breast feed or give replacement feeding.

### 2.3.3 Skin Care and Baby Bath

#### 1) Skin Care:
Gently wipe off the skin to remove blood, mucus, and meconium if any before dressing the baby. Leave vernix on the skin. Use clean soft cotton clothes to dress the baby. Change diapers soon after they are wet or soiled. Ensure that caregivers wash their hands before handling the baby. Don’t rub vernix off vigorously because it can damage the skin. Watch out for Pustules especially in axilla, groin and neck. Other signs of severe infection such as fever and poor feeding should be observed. Do not use plastic nappies and harsh detergents to wash the nappies as it can cause irritation to the skin.

#### 2) Baby Bath:
Bathe the baby daily during summer months and once a week in winter but do sponging daily and avoid exposure. First bath can be given after 24 hours using mild unmedicated soap. Avoid giving deep bath till the cord falls off. After one month, oil massage can be given and after that skin can be exposed to sunlight for added advantage of Vitamin D. Avoid use of talcum powder.

### 2.3.4 Care of Umbilical Stump

The umbilical cord is an important site for entry of spores of tetanus. The health personnel should cut the cord with a clean instrument (i.e., razor blade). Tie the cord tightly with clean thread or use a cord clamp. Keep the cord clean and dry and wash hands before touching it. Tie napkin or diaper below the cord stump. Do not apply gentian violet or an iodine compound, as an alternative to harmful local practices. Bandages are unnecessary and may delay healing and introduce infection. Alcohol cleansing may delay healing. Applying traditional remedies to the cord may cause infections and tetanus. Watch out for Pus discharge from the cord stump. See for Redness around the cord especially if there is swelling. High temperature (more than 38°C) or other signs of infection should be observed.

### 2.3.5 Care of Eyes

Clean eyes immediately after birth with swab soaked in sterile water using separate swab for each eye. Clean from medial to lateral side. Give prophylactic eye drops within 1 hour of birth as per hospital policy. Observe for any discharge from the eyes, especially with redness and swelling around the eyes. Other signs of severe infection, such as fever (more than 36°C) and poor feeding should be observed for.

| Remember | Do not put anything in baby’s eyes |
2.3.6 Weight Record

Most babies lose weight during first 2 to 3 days of life. The weight varies between 5-8 percent of birth weight. The birth weight is regained by the end of first week. The factors contributing to initial weight loss include removal of vernix, mucus, and blood from skin, passage of meconium and reduction of extracellular fluid volume. The transition from inutero placental nutrition to post natal oral feeding is associated with transient interruption in the physical growth of babies. During first year of life average daily weight gain is around 30g, 20g, and 10g during first, second, third and fourth month’s period respectively. Most infants double their birth weight by 5-6 months of age and triple it by their first birth day. It is mandatory that periodic weight record should be taken and charted on Road to Health cards during preschool years.

2.3.7 Immunization

BCG and first dose of OPV and hepatitis B vaccine (HBV) are given at birth or before the baby is discharged from the hospital. The OPV may preferably be given after 3 days because colostrum may interfere with its uptake. The BCG site should be checked for “take” response after 4 weeks. The modified National Vaccination Schedule is depicted in Table 2.2 below.

Table 2.2: Schedule of Immunization (National Immunization Schedule)

<table>
<thead>
<tr>
<th>Age</th>
<th>Vaccination</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Birth</td>
<td>BCG, OPV</td>
</tr>
<tr>
<td>6 weeks</td>
<td>DPT, OPV</td>
</tr>
<tr>
<td>10 weeks</td>
<td>DPT, OPV</td>
</tr>
<tr>
<td>14 weeks</td>
<td>DPT, OPV,</td>
</tr>
<tr>
<td>9 months</td>
<td>Measles,</td>
</tr>
<tr>
<td>18 to 24 months</td>
<td>DPT, OPV</td>
</tr>
<tr>
<td>4 to 5 years</td>
<td>DPT-Booster, OPV-Booster</td>
</tr>
<tr>
<td>10 years</td>
<td>TT(every 5 years)</td>
</tr>
</tbody>
</table>

HBV/HIB/MMR: As per the local government recommendations

- Breast-feeding can be given after OPV and it does not interfere with development of satisfactory immunity.
- Most immunization can be given in the presence of a minor illness.
- Live vaccines should be avoided in immuno-compromised children and symptomatic HIV positive infants.
- When a dose of a vaccine is missed the remaining doses should be administered at the earliest opportunity while keeping in mind that the vaccine dose already given is valid.

2.3.8 Evaluation for Jaundice

- All the infants must be examined for the development and severity of jaundice twice a day for first few days of life.
- Visual assessment in daylight is the preferred method.
2.3.9 Developmental Variations & Physiological Conditions

Knowledge of developmental variations, physiological conditions and their evaluation in newborns is important for advising and assuring the mother. Mothers observe their babies very carefully and are often worried by minor physical peculiarities, which may be of no consequence and do not warrant any therapy.

- **Mastitis Neonatorum**
  - Engorgement of breasts occurs in term babies of both sexes on the third or fourth day and may last for days or even weeks which is due to persistence of maternal hormones for some time.
  - Local massage, fomentation and expression of milk should not be done as it may lead to infection. Mother should be reassured that this regresses on its own.

- **Vaginal bleeding**
  - Vaginal bleeding may occur in female babies about three to five days after birth which is because of withdrawal of maternal hormones. The bleeding is mild and lasts for two to four days.
  - Additional vitamin K is unnecessary.

- **Mucoid vaginal secretions**
  - Most female babies have a thin, greyish, mucoid, vaginal secretion, which should not be mistaken for purulent discharge.

- **Toxic erythema or Erythema Neonatorum**
  - This is an erythematous rash with a central pallor appearing on the second or third day in term neonates which begins on the face and spreads down to the trunk and extremities in about 24 hours. This should be differentiated from pustules which need treatment.
  - It disappears spontaneously after two to three days without any specific treatment. The exact cause is not known.

- **Peeling skin**: Dry skin with peeling and exaggerated transverse sole creases is seen in all postterm and some term babies.

- **Milia**: Yellow–white spots on the nose or face due to retention of sebum, are present in practically all babies and disappear spontaneously.

- **Storkebites (Salmon patches or nevus simplex)**: These are discrete, pinkish-grey, sparse, capillary hemangioma commonly seen at the nape of neck, upper eyelids, forehead and root of the nose. They invariably disappear after a few months.

- **Mongolian blue spots**: In babies of Asiatic origin irregular blue areas of skin pigmentation are often present over the sacral area and buttocks, though extremities and rest of the trunk may also be affected. These spots disappear by the age of six months.

- **Subconjunctival haemorrhage**: Semilunar arcs of sub-conjunctival hemorrhage is a common finding in normal babies. The blood gets reabsorbed after a few days without leaving any pigmentation.
• **Epstein Pearls:** These are white spots, usually one on either side of the median raphe of the hard palate. Similar lesions may be seen on the prepuce. They are of no significance.

• **Sucking callosities:** The presence of these button like, cornified plaques over the centre of upper lip has no significance.

• **Tongue Tie:** It may be in the form of a fibrous frenulum with a notch at the tip of the tongue. This does not interfere with sucking or later speech development.

• **Non retractable prepuce:** The prepuce is normally nonretractable in all male newborn babies and should not be diagnosed as phimosis. The urethral opening is often pinpoint and is visualized with difficulty. The mother should be advised against forcibly retracting the foreskin.

• **Hymenal tags:** Mucosal tags at the margin of hymen are seen in two-third of female infants.

• **Umbilical hernia:** Umbilical hernia may manifest after the age of two weeks or later. Most of these disappear spontaneously by one or two years of age.

• **Vomiting**
  
  – Many normal babies regurgitate or spit out some amount of milk. This regurgitation or vomiting seen soon after feeds is often due to faulty technique of feeding and aerophagy. Proper advice regarding feeding and burping, must be imparted to all mothers.
  
  – If the vomiting is persistent, projectile, or bile stained, the baby should be further investigated.

• **Stool pattern**
  
  – Any baby who has not passed meconium for 24 hrs after birth needs to be evaluated.
  
  – Transitional stools are passed on the third and fourth day after birth. The frequency is increased and these are often semi-loose and greenish-yellow. This settles within 24 to 48 hours. Baby continues to feed well and there is no need for treatment.
  
  – Breast fed babies pass frequent golden yellow, sticky, semi loose stools.
  
  – Many babies pass stools while being fed or soon after a feed due to exaggerated gastrocolic reflex which may persist for a couple of weeks. These infants continue to gain weight satisfactorily & mother should be reassured.
  
  – The increased frequency of breast milk stools is normal and should not be confused with diarrhoea.
  
  – Some breastfed babies may pass stools infrequently (once every few days). This is not constipation.
  
  – Formula fed babies generally have more formed stools.

• **Excessive crying**
  
  – During the first few days of life babies sleep throughout the day and they are awake, noisy and troublesome during the night.
Essential Newborn Care

- Babies cry when they are hungry or in discomfort.
- Discomfort may be due to the unpleasant sensation of a full bladder before passing urine, painful evacuation of hard stools or mere soiling by urine and stools.
- An experienced mother or nurse can usually distinguish between the cry used as a signal for food and the cry of discomfort.
- Persistent crying needs examination and detailed evaluation for inflammatory conditions and other causes.

2.3.10 Advice at Discharge

- **Maintenance of body temperature**
  - Keep the baby dry at all times.
  - During winter, the linen and clothes of the baby should be pre-warmed before dressing. Cover the baby adequately using cap, socks and mittens. Keep the room warm with the help of a heater.
  - During summer months, depending upon the environmental temperature, the baby should be dressed in loose cotton clothes and kept indoors as far as possible.
  - Exposure of the baby to direct sunlight during the hot summer months can lead to serious hyperthermia.

- **Breast feeding**
  - The mother should be advised to feed the baby every two to three hours on a semi-demand schedule both during night and day.
  - During each feed, one breast should be completely emptied before the baby is put to the other breast. There is no need for additional water or other fluids except under medical supervision.

- **Skin care/ Bathing**
  - Special precautions must be taken during bath to prevent draught and chilling.
  - Keep the baby clean and dry.
  - During the winter months, instead of bathing, the baby can be sponged daily to avoid unnecessary exposure and risk of hypothermia.

- **Care of the umbilical stump**
  - The cord must be left open without any dressing.
  - Do not apply any medication on the cord. The cord usually falls off after 4 to 10 days.

- **Care of the eyes**
  - Some neonates may develop persistent epiphora (watering) due to blockage of nasolacrimal duct by epithelial debris. The mother should be advised to massage the nasolacrimal duct area (by massaging the either side of the nose adjacent to the medial canthus) 5 to 8 times daily, each time before she feeds the baby.
  - Avoid the use of kajal as it may transmit infections or may even cause lead poisoning.
2.3.11 Practices to be Discouraged

A variety of traditional practices are common in many communities. These can be beneficial such as oil massage, inconsequential such as putting black mark on forehead. However, a variety of harmful traditional practices must be actively discouraged such as:

- Applying kajal/surma in eyes.
- Putting oil or boric acid in nostrils or ears.
- Applying cow dung on the cord.

2.3.12 Danger Signs

<table>
<thead>
<tr>
<th>DANGER SIGNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bleeding from any site</td>
</tr>
<tr>
<td>Appearance of jaundice within 24 hours of age or yellow staining of palms or soles</td>
</tr>
<tr>
<td>Failure to pass meconium within 24 hours or urine within 48 hours</td>
</tr>
<tr>
<td>Persistent vomiting</td>
</tr>
<tr>
<td>Poor feeding</td>
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<tr>
<td>Undue lethargy</td>
</tr>
<tr>
<td>Excessive crying</td>
</tr>
<tr>
<td>Drooling of saliva or choking during feeding</td>
</tr>
<tr>
<td>Respiratory difficulty, apneic attacks or cyanosis</td>
</tr>
<tr>
<td>Sudden rise or fall in body temperature</td>
</tr>
<tr>
<td>Seizures</td>
</tr>
<tr>
<td>Evidence of superficial infections such as conjunctivitis, pustules, umbilical sepsis (redness at base of the stump and discharge), oral thrush, etc.</td>
</tr>
</tbody>
</table>

2.3.13 Checklist before Discharge

Ideally infant should be discharged after 48 hrs once all of the following criteria are fulfilled:

- Infant is free from any illness including significant jaundice.

- The infant has been immunized.

- Adequacy of breastfeeding has been established. This must be assessed in all infants and the same would be indicated by passage of urine at 6 to 8 times/24 hr, onset of transitional stools, baby sleeping well for 2-3 hr after feeding. If there is any concern about adequacy of breastfeeding, the infant can be weighed on the same weighing scale that was used to weigh the infant at birth. Excessive weight loss (normal 8-10% of birth weight by 3-4 days of age) would indicate inadequate breastfeeding.

- Mother is free from any significant illness and confident to take care of her infant.
2.3.14 Follow Up

Each baby should be followed up in the well-baby clinic for assessment of growth and development, early diagnosis and management of illnesses and health education of parents. It is preferable that every baby is seen and assessed by a health worker at each immunization visit. The developmental assessment should be organized both in the community and the facility.

Check Your Progress 1

1) Describe the general principles of maintaining the body temperature.
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2) Mention the advantages of breast feeding.
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3) Fill in the blanks:
   a) Baby bath should be postponed for .......................hours after birth.
   b) Clean the eye immediately with swab soaked in ..............................
   c) Do not put anything in eyes, it can cause ...................................
   d) Do not Apply ......................... or ...................... on umbilical stump as an alternative to harmful local practices.

4) Describe National immunization schedule.
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2.4 ASSESSMENT OF NEWBORN

One of the basic purpose of assessment is to observe for adjustment of newborn to extrautenine life and identify the normal expected deviations which may at times hinder smooth progress towards early postnatal period. The assessment includes thorough maternal and perinatal history, examination of records and
head to toe examination. Physical assessment can be divided into four phases:

- Initial examination,
- Assessment of Gestational Age
- First day (within 24 hours) detailed examination
- Examination at discharge

2.4.1 Initial Assessment

Quick but thorough clinical screening is essential to identify any life threatening congenital anomalies at birth and birth injuries. The cut end of the umbilical cord should be inspected for the number of vessels. Normally there are two umbilical arteries and one umbilical vein. The presence of a single umbilical artery is associated with internal congenital malformations in 15 to 20 per cent of cases. The commonly associated malformations include esophageal atresia, Imperforate anus and genito –urinary anomalies. Single palmar crease (Simian crease) has increased association with additional anomalies including Down Syndrome. The face and head should be closely observed for any asymmetry and dysmorphic features. While crying, if the angle of the mouth and the mandible are pulled down and the infant has asymmetric crying it is indicative of hypoplasia of the depressor angularis oris muscle. This is a useful marker of associated cardiovascular anomalies and congenital dislocation of hips. The infant should be examined for location and patency of all the orifices because anomalies are frequently encountered around the orifices. The oral cavity must be examined to exclude cleft palate. The Patency of the esophagus should be checked by passing a stiff rubber catheter into the stomach in the following summations:

i) Small –for-dates baby
ii) Single umbilical artery
iii) Polyhydramnios
iv) Excessive drooling of saliva

If there is no esophageal atresia and the catheter has reached the stomach, Gastric contents should be aspirated. If gastric aspirate exceeds 20 ml in volume it is strongly suggestive of high intestinal or duodenal atresia. The anomalies are concentrated over the mid-line areas in the front and back e.g. spina bifida, Menigomyelocele, ambiguous genitalia, Hypospadias, exomphalos, cleft lip, cleft palate etc. The abdomen should be palpated for any masses and heart examined for its position and any displacement of heart towards the right side in association with respiratory difficulty and resuscitation problem, is suggestive of either diaphragmatic hernia or pneumothorax on the left side.

2.4.2 Assessment of Gestational Age

The gestational age and birth weight of newborn are important indicators not only to determine the morbidity and mortality status in the first week of life but also provide guidelines for management. Classification of infants by birth weight and gestational age helps to predict mortality risks.

When a baby is born, 2 parameters should be considered.

1) Birth weight of the baby (normally babies weigh more than 2500 gms)
2) The gestation or the maturity of the baby
Classification of a baby

We classify the babies to determine the risk of problems. The babies who are preterm as well as SGA are more at risk than the baby who is only preterm. We classify as (Fig. 2.5):

- **Appropriate for Date (AFD) of Gestational Age (AGA)**
  The babies whose birth weight is between 10th and 90th percentile can be presumed to have grown at a normal rate for their period of gestational age.

- **Small for Date (SFD)**
  The babies whose birth weight is less than 10th percentile for the period of their gestational age.

- **Large for Date (LFD)**
  The babies whose birth weight is more than 90th percentile for the period of their gestational age.

Newborn baby can be LBW because of two reasons.
1) Preterm
2) Intrauterine growth retardation (IUGR).

The babies are defined as small for gestational age (SGA), if their weight is below the 10th percentile on the chart, for that gestational age. Two thirds of our LBW neonates fall in this category (Fig. 2.5)

**Note:** At times, a LBW neonate may be both preterm as well as SGA.
Gestational age of a fetus or of a newborn can be assessed currently by three different methods: the mother’s menstrual history, prenatal ultrasonography and the postnatal maturational examination.

**Identification of a preterm baby**

The gestational age of a baby can be estimated by LMP, antenatal sonography (especially 1st trimester), however accurate estimation is possible by doing a detailed physical and a neuromuscular examination. An illustrated scoring system like, Expanded Ballard Score (EBS) can be used for this purpose. The following are some of the parameters used in gestational assessment:

A) **Physical maturity**

**Skin:** The skin of preterm neonate is thin, transparent and gelatinous whereas that of a term neonate is thick non-gelatinous and keratinized.

**Hair and Lanugo:**

Hair are wooly and fuzzy. The back of the preterm babies has abundant growth of fine hair called lanugo. The hairy area turns bald as the gestation matures

**Ear Cartilage:** The external ear or the pinna is soft and devoid of cartilage in preterm neonates and hence, it does not recoil back promptly on being folded. In a term baby there is instant recoil (Fig 2.6).

![Ear Cartilage](image)

**Breast Nodule:** Breast nodule measures less than 5 mm in preterm neonates and 5 mm or more in term babies (Fig. 2.7).

![Breast Nodule](image)
Sole Creases: Anterior one third of the sole reveals a transverse skin crease in preterm neonates and in term neonates they are present over the anterior two-thirds (Fig. 2.8).

![Fig. 2.8: Sole Creases](image)

External Genitalia: In preterm males, the scrotum does not have rugae and testes are not descended into the scrotum. In female infants, the labia are widely separated, not covering the labia minora, resulting in the prominent appearance of the clitoris (Fig. 2.9).

![Fig. 2.9: External Genitalia – Male and Female](image)
Assessment of maturity of the neonate is fairly reliable on the basis of physical characteristics but they are of limited value to assess the gestational age in less than 36 weeks of maturity.

B) The neurological characteristics are more reliable for the precise assessment of maturity, the neurological assessment is performed based on four fundamental observations, i.e., muscle tone, joint mobility, certain automatic reflexes, and fundus examination.

1) Muscle tone of the newborn baby is assessed by three parameters, i.e., posture or attitude, passive tone (popliteal angle and scarf sign) and active tone (recoil).

2) Joint mobility is less in preterm babies. A term baby has more flexed and relaxed joint. The degree of flexion at ankle and wrist (square -window) is limited due to stiffness of joint in early gestation.

3) Automatic reflexes like Moro reflex, pupillary response to light, blink response to glabellar tap, grasp response, rooting reflex with coordinated sucking efforts are assessed to detect the specific age of gestational maturity based on appearance of these reflexes.

4) The fundus examination for disappearance of anterior vascular capsule of the lens is done to assess the gestational age.

New Ballard Score for Gestational Age Assessment

The Ballard Maturational Assessment, Ballard Score, or Ballard Scale is a commonly used technique of gestational age assessment.

The new ballard Scale, a revision of the original scale, can be clinically used with newborns as young as 20 to 44 week of gestation. It has six physical and six neuromuscular characteristics. Each sign has a number score from -1 to 5, and the cumulative score relates with a maturity rating from 20 to 44 week of gestation. It also includes signs of extremely premature newborns, such as fused eyelids, imperceptible breast tissue, sticky friable breast tissue, sticky friable transparent skin, no lanugo, and square window (flexion of wrist) angle of greater than 90 degrees. The examination can be performed at a postnatal age less than 12 hours after birth.

The scoring relies on the intra-uterine changes that the fetus undergoes during its maturation. Whereas the neurological criteria depend mainly upon muscle tone, the physical ones rely on anatomical changes. The pre-term neonate (less than 37 weeks of age) is in a state of physiological hypertonia. This tone increases throughout the fetal growth period, meaning a more premature baby would have lesser muscle tone.

Physical Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Technique for assessment</th>
<th>Observation and characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Skin</td>
<td>Observe and feel the skin. For scoring purposes, the square which describes the infant most closely should be selected.</td>
<td>Maturation of fetal skin involves the development of its intrinsic structures concurrent with the gradual loss of its protective coating, the vernix caseosa. Hence, it thickens, dries and becomes wrinkled and/or peels, and may develop a rash as fetal maturation progresses.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Technique for assessment</td>
<td>Observation and characteristics</td>
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<td>--------------------</td>
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</tr>
<tr>
<td>2. Lanugo</td>
<td>Observe the upper and lower areas of the infant’s back for relative amount of lanugo</td>
<td>Lanugo is the fine hair covering the body of the fetus. In extreme immaturity, the skin lacks any lanugo. It begins to appear at approximately the 24th to 25th week and is usually abundant, especially across the shoulders and upper back, by the 28th week of gestation. Thinning occurs first over the lower back, wearing away as the fetal body curves forward into its mature, flexed position. Bald areas appear and become larger over the lumbo-sacral area. At term, most of the fetal back is devoid of lanugo, i.e., the back is mostly bald. Variability in amount and location of lanugo at a given gestational age may be attributed in part to familial or national traits and to certain hormonal, metabolic, and nutritional influences. For example, infants of diabetic mothers characteristically have abundant lanugo on their pinnae and upper back until close to or beyond full-term gestation.</td>
</tr>
<tr>
<td>3. Plantar creases (Fig. 2.10)</td>
<td>Observe the creases on the sole of the foot and measurement is done by placing the infant’s foot on a metric tape measure and noting the distance from the back of the heel to the tip of the great toe.</td>
<td>This item pertains to the major foot creases on the sole of the foot. The first crease appears on the anterior sole at the ball of the foot. Very premature and extremely immature infants have no detectable foot creases. To further help define gestational age of these infants, measuring the foot length or heel-toe distance is helpful. For heel-toe distances less than 40 mm, a minus two score (-2) is assigned; for those between 40 and 50 mm, a minus one score (-1) is assigned.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Technique for assessment</td>
<td>Observation and characteristics</td>
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<tr>
<td>---------------------------</td>
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<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td><strong>4. Breast</strong>&lt;br&gt;(Fig. 2.11)</td>
<td>The examiner notes the size of the areola and the presence or absence of stippling (created by the developing papillae of Montgomery). The examiner then palpates the breast tissue beneath the skin by holding it between thumb and forefinger, estimating its diameter in millimeters, and selects the appropriate square on the score sheet.</td>
<td>The breast bud consists of breast tissue that is stimulated to grow by maternal estrogens and fatty tissue which is dependent upon fetal nutritional status. Under- and over-nutrition of the fetus may affect breast size variation at a given gestation.</td>
</tr>
<tr>
<td><strong>5. Eye/Ear</strong></td>
<td>Assessment includes palpation for cartilage thickness, then folding the pinna forward toward the face and releasing it. The examiner notes the rapidity with which the folded pinna snaps back away from the face when released, then selects the square that most closely describes the degree of cartilagenous development.</td>
<td>The pinna of the fetal ear changes its configuration and increases in cartilage content as maturation progresses. In very premature infants, the pinnae may remain folded when released. The slightly more mature infant will have one or both eyelids fused but one or both will be partly separable by the light traction of the examiner’s fingertips. These findings will allow the examiner to select on the score sheet a minus two (-2) for slightly fused, or minus one (-1) for loosely or partially fused eyelids.</td>
</tr>
<tr>
<td><strong>6. Genitals-Male</strong>&lt;br&gt;(Fig. 2.12)</td>
<td>Observe and palpate the testicles</td>
<td>The fetal testicles begin their descent from the peritoneal cavity into the scrotal sac at approximately the 30th week of gestation. The left testicle precedes the right and usually enters the scrotum during the 32nd week. Both testicles are usually palpable in the upper to lower inguinal canals by the end of the 33rd to 34th weeks of gestation. Concurrently, the scrotal</td>
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<tr>
<td>Parameter</td>
<td>Technique for assessment</td>
<td>Observation and characteristics</td>
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<tr>
<td>7. Genitals-Female (Fig. 2.13)</td>
<td>To examine the infant female, the hips should be only partially abducted, i.e., to approximately 45° from the horizontal with the infant lying supine.</td>
<td>In extreme prematurity, the labia are flat and the clitoris is very prominent and may resemble the male phallus. As maturation progresses, the clitoris becomes less prominent and labia minora become more prominent. Nearing term, both clitoris and labia minora recede and are eventually enveloped by the enlarging labia majora.</td>
</tr>
<tr>
<td>Neuromuscular Examination</td>
<td></td>
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</tr>
<tr>
<td>1. Posture</td>
<td>To elicit the posture item, the infant is placed supine. Gentle manipulation (flex if extended; extend if flexed) of the extremities will allow the infant to seek the baseline position of comfort. Hip flexion without adduction results in the frog-leg position as depicted in posture square #3. Hip adduction accompanying flexion is depicted by the acute angle at the hips in posture square #4. The figure that most closely depicts the infant’s preferred posture is selected.</td>
<td>Total body muscle tone is reflected in the infant’s preferred posture at rest and also resistance to stretch of individual muscle groups. The preterm infant primarily exhibits unopposed passive extensor tone, while the infant approaching term shows progressively less opposed passive flexor tone.</td>
</tr>
<tr>
<td>2. Square Window (Fig. 2.14)</td>
<td>The examiner straightens the infant’s fingers and applies gentle pressure on the dorsum of the hand, close to the fingers. Measure the angle of flexion.</td>
<td>Wrist flexibility and/or resistance to extensor stretching are responsible for the resulting angle of flexion at the wrist.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Technique for assessment</td>
<td>Observation and characteristics</td>
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<td>3. Arm Recoil</td>
<td>With the infant lying supine, the examiner places one hand beneath the infant’s elbow for support. Taking the infant’s hand, the examiner briefly sets the elbow in flexion, then momentarily extends the arm before releasing the hand. The angle of recoil to which the forearm springs back into flexion is noted, and the appropriate square is selected on the score sheet.</td>
<td>The extremely pre-term infant will not exhibit any arm recoil. Square #4 is selected only if there is contact between the infant’s fist and face. This is seen in term and post term infants.</td>
</tr>
<tr>
<td>4. Popliteal angle (Fig. 2.15)</td>
<td>With the infant lying supine, and with diaper removed, the thigh is placed gently on the infant’s abdomen with the knee fully flexed. After the infant has relaxed into this position, the examiner gently grasps the foot at the sides with one hand while supporting the side of the thigh with the other. The leg is extended until a definite resistance to extension is appreciated. At this point the angle formed at the knee by the upper and lower leg is measured.</td>
<td>An angle of less than 90 degree has score of 5</td>
</tr>
</tbody>
</table>
### Parameter | Technique for assessment | Observation and characteristics
--- | --- | ---
5. Scarf Sign (Fig. 2.16) | With the infant lying supine, the examiner adjusts the infant’s head to the midline and supports the infant’s hand across the upper chest with one hand and the thumb of the examiner’s other hand is placed on the infant’s elbow. The examiner gently pulls the elbow across the chest, feeling for resistance to extension of posterior shoulder. | This maneuver tests the passive tone of the flexors about the shoulder girdle. The point on the chest to which the elbow moves easily prior to significant resistance is noted. Landmarks noted in order of increasing maturity are: full scarf at the level girdle flexor muscles of the neck (-1); contralateral axillary line (0); contralateral nipple line (1); xyphoid process (2); ipsilateral nipple line (3); and ipsilateral axillary line (4). |
6. Heel to Ear | The infant is placed supine and the flexed lower extremity is brought to rest on the mattress alongside the infant’s trunk. The examiner supports the infant’s thigh laterally alongside the body with the palm of one hand. The other hand is used to grasp the infant’s foot at the sides and to pull it toward the ipsilateral ear. | The examiner feels for resistance to extension of the posterior pelvic girdle flexors and notes the location of the heel where significant resistance is appreciated. Landmarks noted in order of increasing maturity include resistance felt when the heel is at or near the: ear (-1); nose (0); chin level (1); nipple line (2); umbilical area (3); and femoral crease (4). |

### Summary of the New Ballard Score

The sum of all 12 criteria represents the neuromuscular and physical maturation of the fetus. When compared to the grid on the score sheet, the score denotes the infant’s gestational age by maturational examination.

The maturational assessment of gestational age is a clinical tool that may be influenced by certain biological factors. A working knowledge of the assessment tool includes a knowledge of the standardized method for performing the examination, and an awareness of those intrauterine factors that influence the neuromuscular and physical maturational rates of the fetus. This approach increases the accuracy and validity of the tool and facilitates the examiner’s understanding and interpretation of the score (Fig. 2.17).
2.4.3 First Day (within 24 hour) Examination

The purpose is to record certain measurements, to detect any missed anomaly, to inquire about feeding behaviour and passage of first meconium and urine etc.

1) Vital signs

Vital signs are recorded when baby is quiet. Record temperature to detect cold stress and hypothermia. Temperature is measured by axillary method. The axillary

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**Physical Maturity**

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<thead>
<tr>
<th>Score</th>
<th>Maturity Rating</th>
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<td>2</td>
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**Skin**

- Sticky, friable, transparent
- Gelationous red, translucent
- Smooth, pink, visible veins
- Superficial peeling, &/or rash, few veins
- Cracking, pale areas, rare veins
- Parchment deep cracking, no vessels
- Leathery, cracked, wrinkled

**Lanugo**

- None
- Sparse
- Abundant
- Thinning
- Bald areas
- Mostly bald

**Plantar surface**

- Heel-toe 40-50 mm: -1
- <40: -2
- Faint red marks
- Anterior transverse crease only
- Creases on anterior 2/3
- Creases over entire sole
- Full areola, 5-10 mm

**Breast**

- Imperceptible
- Barely perceptible
- Flat areola, no bud
- Stripped areola, 1-2 mm bud
- Raised areola, 3-4 mm bud
- Thick cartilage, ear stiff

**Eye/Ear**

- Lids fused loosely (-1), tightly (-2), folded
- Lids open, pinna flat, stays soft; slow recoil
- Slightly curved pinna; but ready recoil
- Well-curved pinna, soft recoil
- Formed & firm, instant

**Genitals male**

- Scrotum flat, smooth
- Scrotum empty, faint rugae
- Testes in upper canal, rare rugae
- Testes descending few rugae, rugae
- Testes down, good rugae
- Testes pendulous, deep regae

**Genitals female**

- Clitoris prominent, labia flat
- Prominent clitoris, small labia minora
- Prominent clitoris, enlarging minora
- Major & minora equally prominent
- Major large, minora small
- Majora cover clitoris & minora

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**Maturity Rating**

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<td>44</td>
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temperature is slightly lower than core temperature i.e. 0.2°F. The core temperature is usually between 36.5 to 37.5°C.

Both heart rate and respiratory rate should be counted for full one minute to detect physiological status. Heart rate is around 120-140 beats per minute. Respiratory rate is 40-60 breaths per minute. Breathing is periodic and irregular. Average blood pressure in a term baby is around 60/40mmHg.

2) Physical Measurements

- **Length:**
  Take length using tape measure to assess crown heel length. Average length at birth is 47-50 cm.

- **Weight:**
  The normal birth weight varies between 2800-3200 gms. The first weight should be taken soon after birth and if not taken than within first 12 hours of birth.

- **Head Circumference:**
  The average head circumference is between 33-35.5 cm (13-14 inches). Soon after birth the measurement may be less than the average due to moulding process in vaginal delivery. By second and third day the head contour and size becomes normal.

  In small hydrocephalic babies circumference is more than 3 cm bigger than the chest.

- **Chest Circumference:**
  The average chest circumference is 30.5-33 cms (12-13 inches). The head circumference is usually about 2-3 cm (1 inch) greater than chest. At birth because of moulding both the circumference may appear equal.

3) Head to Toe Assessment

- **General behaviour:**
  Posture, color, activity and general alertness and sleep patterns, crying etc. should be assessed carefully.

  The behaviour of the newborn demonstrates neurological status. In general the neonate appears drowsy, calm, quiet and sleepy most of the day and night time. Note sign of irritability and degree of alertness. Assess the level of satisfaction after feeding, comfortable with rocking and cuddling, is awakened by loud noise, disturbed by any stimuli.

Fig: 2.18  Flexed posture
Postnatal Care of Normal Newborn and Normal Variations

Posture: Most of the full term neonates are born in a vertex presentation with head flexed, chin resting on the upper chest, arms flexed, hands clenched, legs flexed at knees and hips and feet dorsiflexed. The vertebral column is also flexed (Fig. 2.18).

![Fig. 2.18: Position of a newborn at birth](image)

Cry: Record and report if newborn cried immediately after birth. Listen whether cry is loud and strong (normal baby), weak or whiny (low birth weight baby) or absent (asphyxiated baby) (Fig. 2.19).

Activity: Observe whether baby is active (normal baby), less active or in active (low birth weight/asphyxiated).

Skin: Texture of the skin i.e. velvety, smooth and good turgor indicates healthy skin. The colour of the skin is usually pink to red, by second to third day it turns to natural tone and is dry and flaky. The colour of the skin however, depends on the racial and familial background. Babies born by breech presentation, assisted deliveries may have ecchymosis or petechia caused by birth trauma. Lanugo is the presence of fine hair on the body and is present in term infant. Check for “vernix” distribution all over the body and in skin folds. As baby comes to term it decreases.

Some normal variations observed in newborn that do not require any treatment are:

Milia: These are distended sebaceous glands seen as white small papules on cheeks, chin and nose.

Miliaria or sudamina: These are distended sweat glands seen as small vesicles on face.

Erythema Toxicum: The pink, papular rashes with vesicles superimposed are seen on thorax, back, buttocks, and abdomen. These rashes appear in 24-48 hrs after birth and get resolved after several days.

Harlequin Colour Change: These appear as clear demarcated change in colour as infant lies on side. Lower half of the body becomes pink and upper half is pale.

Mongolian Spots: These are deep blue pigmented irregular patches seen on gluteal and sacral region.

Telangiectatic Nevi: These are flat, deep pink localized areas seen in back of neck.

After assessing the neonate for appearance and behaviour continue with head to toe examination as given below:
• **Head**

**Inspect the head for:**

**Hair** whether present or not and if present, note the colour and texture of hair. Hair are silky and black in appearance in term infant and woolly and fuzzy in preterm infant.

**Shape** whether round (normal), oval (slight moulding or a small caput formation (Fig. 2.20) in normal labour, long (excessive moulding or a large caput formation in prolong labour) or asymmetrical.

**Size** whether small (microcephaly), medium (normal), large (hydrocephaly or prematurity) or unusual (anencephaly)

![Fig:2.20 Caput succedaneum](image)

![Fig. 2.21: Cephalhematoma](image)

Observe for caput succedaneum and cephalhematoma (Fig. 2.21). Palpate the skull for sutures and fontanels, noting size, shape, moulding or any abnormal closure. The sutures feel like cracks in between the skull bones whereas, fontanels feel like wide spots at the junction of the sutures. The anterior fontanel is diamond shaped and posterior is triangular. The fontanels feel flat, firm and well demarcated, at times pulsation can be felt at the anterior fontanel.

Assess the degree of head control, the head lag is a normal finding in the newborn, but has ability to control the head in certain positions. In ventral suspension, head is held in straight line with the spinal column. When put on abdomen can lift the head slightly and turn it from side to side.

• **Face**

Observe the **face** whether triangular (normal), round being swollen (prolonged labour or hemolytic disease) or asymmetrical and eye brows and eyelashes present
(normal baby) or not (low birth weight). While crying, if the angle of the mouth and the mandible are pulled down and the infant has asymmetric crying it is indicative of hypoplasia of the depressor angularis oris muscle. This is a useful marker of associated cardiovascular anomalies and congenital dislocation of hips.

- **Eyes**

Observe the eyes whether normal or slanting, normally spaced or not (chromosomal abnormality), opened or closed. Observe for any squint (normal) and subconjunctival bleeding (in the form of red patch or ring).

Eyes appear edematous for the first two days after delivery. Infant keeps eyes tightly closed. Tears may be present at birth. Any purulent discharge is a sign of infection (Ophthalmia neonatorum). Assess the color of sclera that appears whitish, bluish and clear. Cornea is examined for any haziness. **Nystagmus or strabismus** is normally seen at birth.

- **Ears**

Ears should be examined for formation, size, shape, sufficient cartilage, position (low set ears indicate chromosomal anomaly). Skin tag and periauricular sinus etc.

The top of pinna lies in the horizontal plane to the outer canthus of the eye. The pinna is seen flat against the side of the head due to well formed cartilage. Pinna is firm, cartilage felt along with edges. Draw an imaginary line backward from outer corner of eye towards the pinna. If more than 90% of the ear is below this line, it is said to be a low set ear. Instant recoil of ear pinna is present in term baby (Fig. 2.22).

The auditory ability of the neonate can be assessed by eliciting startle reflex. Absence of startle reflex in response to solid noise may indicate loss of hearing and should be reported.

![Ear cartilage in preterm and term neonate](Fig.2.22: Ear cartilage in preterm and term neonate)

- **Nose**

The nose appears flat after birth. Observe the nose for shape and size. Normally it is flat except at the tip which is prominent. Nasal passage is patent at birth.
• **Mouth and Throat**

The anomalies are commonly seen around orifices. Any gross anomaly would be evident like cleft lip and palate.

Some abnormalities seen in mouth and throat include presence of cleft lip, cleft palate (either single or in combination, unilaterally or bilaterally) (Fig. 2.23), posterior (backward) displacement of tongue (glossoptosis), abnormal smallness of the jaw (micrognathia), indicative of Pierre-Robin syndrome.

Presence of white adherent patches on tongue, palate and buccal surfaces means presence of candidiasis (oral thrush).

Excessive salivation, drooling, inability to pass nasogastric tube, respiratory distress and choking with cyanosis are suggestive of esophageal arteria with tracheoesophageal fistula.

Sucking and rooting reflexes are explained along with neurological assessment.

![Fig. 2.23: Cleft Lip And Cleft Palate](image)

- **Neck**

Neck should be examined for mobility, fractured clavicle, stiffness, hyperextension, torticollis (spasmodic, unilateral contraction of neck muscle resulting in head tilted to one side), any cyst or mass (thyroglossal cyst, cystic hygroma) and webbing.

Palpate lymph nodes in the neck and postauricular area. Also check for range of motion of the neck.

- **Chest**

A look at the chest of the neonate will show circular shape because of equal anteroposterior and lateral diameter.

Development of nipple and breast tissue should be checked to assess gestational age. Inspect nipples whether well formed (normal baby), poorly formed or absent (pre term baby). Palpate around one nipple to feel for small nodule of breast tissues whether present (normal baby) or absent (pre term baby). Measure the diameter of areola, it is 5-10mm in term baby (Fig. 2.24).
Auscultate the chest for equal air entry in both the lungs.

Check for the heart sounds, if there is extra murmur or extra beat. Observe the infant for cyanosis when cries.

![Fig. 2.24: Breast Nodule In Preterm And Term Neonate](image)

- **Abdomen**

Abdomen is soft, symmetrical, slightly round and moves synchronously with chest in movement. In premature neonates, abdomen is distended due to poor muscle tone. If the abdomen is concave, it is indicative of diaphragmatic hernia. Check for exomphalos or omphalocele which is protrusion of the intestinal organs outside the abdomen. Inspect the umbilical cord for two arteries and one vein.

Palpation of abdomen for liver, spleen or any lump. Liver edge is normally palpable, 2 cm below costal margins. Check for the pulsation of the femoral artery on both the legs.

- **Genitalia**

**Genitalia Female**

The labia majora covers the labia minora completely in full term babies. The vernix caseosa is present between labial folds. A hymen tag is visible from the posterior opening of the vagina and disappears in several weeks. In the first week of life, vaginal discharge is seen (Pseudomenstruation) that disappears by 2-4 weeks. Presence of any fecal discharge from vaginal orifice may be due to rectovaginal fistula (Fig. 2.25).

![Fig. 2.25: Female genitalia in term neonate](image)

**Genitalia Male** — The urethral opening is located at the tip of the penis, covered by prepuce. The scrotum is large, pendulous with dark pigmentation of the overlying skin. The testis can be palpated bilaterally in the scrotal sac.
Presence of urethral opening on ventral surface of penis (hypospadias), on dorsal surface of penis (epispadias), unpalpable testis in scrotum (true undescended testis), absence of testis masses in the scrotum, fluid in the scrotum (hydrocele), meconium from scrotum, ambiguous genitalia are some of the abnormal findings which need further assessment.

- **Anus**
  
  Check for anal opening (imperforate anus and passage of meconium). Absence of anal opening is serious anomaly.

- **Back**
  
  ![Fig. 2.26: a) Meningocele  
  Fig. 2.26: b) Myelomeningocele](image)

  Inspect the back for any mass, dimple, tuft of hair indicating spina bifida occulta. Congenital defect like Spina bifida, meningocele, meningomyelocele, anencephaly are usually detected during initial assessment. Back to be checked for abnormal curvature of the spine (Fig. 2.26).

- **Hips**
  
  Examination of hips to be done to detect congenital hip dislocation. Positive Ortolani’s sign and symmetrical gluteal folds are indicative of the condition.

- **Extremities**
  
  Extremities are examined for fractures, paralysis, range of motion and irregular position. Fingers and toes to be checked for missing digits, extra digits (polydactyly) or fused digits (syndactyly). Feet to be looked for structural or positional abnormalities mainly club foot (talipes equinovarus) (Fig. 2.27).
Observe the foot for sole crease whether deep, faint or absent (pre term) and presence over the entire sole (term) (Fig. 2.28).

![Fig. 2.28: Sole crease](image)

4) **Neurological Assessment**: Neurological assessment is the most critical part of the newborn. Most of the reflexes are examined while doing the head-to-toe assessment. Some general reflexes are assessed at the end as they disturb the infant and interfere with the examination.

- **Blinking or corneal reflex**: Blinking/closing of the eyes on appearance of sudden bright light. It persists throughout life.
- **Papillary reflex**: It is constriction of pupil in response to bright light and dilation upon removal of light. It persists throughout life.
- **Doll’s eye**: Inability of eyes to adjust immediately to the right or left turning of head. It disappears when fixation of eyes develops. If persists, it indicates neurologic damage.
- **Glabellar reflex**: Tapping at glabella (bridge of nose) results in closing of eyes tightly.
- **Sneezing reflex**: It is spontaneous response of nasal passages to any irritation or obstruction. It persists throughout life.
- **Sucking reflex**: Sucking movements of circumoral area in response to stimulation or even without stimulation such as during sleep. It is seen in infants.
- **Rooting reflex**: Turning of head by infant to the side of stimulation made on circumoral area, or cheek. It disappears by 3-4 months of age, but may appear throughout infancy.
- **Gag reflex**: Stimulation of posterior pharynx by food, tube (while doing suction, passing nasogastric tube) causes infant to gag. It persists throughout life.
- **Yawn reflex**: Attempt to inspire air in spontaneous response to decreased oxygen. It persists throughout life.
• **Grasping reflex**: It is flexion of hands and feet whenever the base of the digits is touched. Place your one finger in the baby’s hand, it holds the finger momentarily. This is the grasping reflex response (Fig. 2.29).

• **Babinski reflex**: It is hyper extension of toes and dorisflexion of hallux (great toe) when outer aspect of foot is stroked upward from heel. It disappears by first year of life.

• **Moros reflex**: Sudden movement or change in equilibrium of the neonate causes sudden extension and abduction of extremities and fanning of fingers. The index finger and thumb form ‘C’ shape. The movements are followed by flexion and adduction of extremities. Legs may weakly flex. Infant may cry. It disappears after 3-4 months of age (Fig. 2.30).

• **Startle reflex**: Sudden loud noises cause abduction of the arms with flexion of elbows. Hands are clenched. It disappears by four months of age.

• **Tonic neck Reflex**: Position the baby on its back with head turned to one side and observe for partial or complete extension of the arm and leg on the side it is facing and flexion of arm and leg on the opposite side. This is the tonic neck reflex response.
2.4.4 Examination at Discharge

Purposes of examination at discharge are:

- To assess adjustment of newborn to independent life in terms of temperature maintenance, respiration and feeding
- To detect any missed anomaly
- To assess breast feeding
- To detect occurrence of any superficial infection and
- To educate the mother about newborn care.

At the time of discharge from the hospital all neonates should be examined in detail to detect any missed anomaly and birth injury. A neonate who is feeding well on the breast, has warm and pink palms and soles and having no danger signs is a healthy infant. Mother should be advised during discharge about essential care of neonate, danger signs and need for follow up at regular intervals.

2.5 NURSING CARE OF NEONATE

a) Establishment and maintenance of respiration:
- Assess the cry of the baby (failure to cry may be due to obstruction of the air passage with mucous).
- Position on the back or the abdomen with the head lowered 15 – 30º to facilitate mucus drainage.
- Keep the newborn warm.

b) Stabilization and maintenance of body temperature:
- Assess the body temperature of newborn.
- Dry the hair & skin with warm soft dry towels.
- Drape the neonate in blankets or put the neonate in heated environment.
Essential Newborn Care

- Don’t give bath until body temperature is normal and stable.
- Don’t expose the newborn.
- Dress the infant and cover with blankets.
- Head can be covered with cap and feet with booties if heat loss is a problem (Fig. 2.32).

![Fig. 2.32: Well covered babies](image)

c) **Provision of optimal nutrition:**
   - Feed baby within ½ hour of delivery.
   - Explain mother regarding importance of breast feeding & teach breast feeding technique.
   - Feed child on demand for 2-3 days and thereafter, regular intervals and burp the newborn after breast feeding.
   - Advice parents and relatives to feed neonate exclusively with breast milk.

d) **Prevention of infection and injury:**
   - Keep the baby’s environment clean and tidy.
   - Hand-wash before handling the baby.
   - Use clean clothes, linen and equipments only.
   - Give injection Vit-K if prescribed.
   - Assess the condition of umbilical cord. Do not apply anything on the umbilical cord.
   - Teach parents to tie diaper below the cord.
   - Give baby bath in the midmorning. Give special attention to groin, axilla and anal regions.
   - Change napkin whenever soiled.
   - Don’t apply powder in excess on skin.

e) **Establishment of mother child bonding:**
   - Place the baby over the mother’s abdomen immediately after delivery.
   - Promote rooming-in by advising mother to put the baby near her.
• Assess maternal attaching behaviour by watching for gazing, kissing and holding the infant.
• Advice mother to talk to the infant.
• Assess infant attachment behaviour like sucking, crying, body and eye movements.

### Check Your Progress 2

1) Mention the purposes of examination at discharge of newborn.

2) Define the following reflexes: a) Sucking reflex. b) Rooting reflex. c) Swallowing reflex d) Moros reflex

3) What nursing measures will you take to establish respiration?

4) Fill in the blanks:
   a) Axillary temperature below ...................... degree centigrade is called hypothermia.
   b) Position on the back or the abdomen with the head lowered at 15-30º to facilitate .....................
   c) Babinski reflex disappears by the end of ......................

### 2.6 LET US SUM UP

In this unit you have learnt about the examination and care of term baby at birth and after 24 hours. The main focus is given on head to toe examination that includes somatic and physiological measurement, general appearance and assessment of neurological reflexes. The care of the newborn is explained under
two sub-sections. The first sub-section is on early care of newborn and second sub-section is related to maintenance of temperature, breast feeding, care of skin, eye and umbilical cord. We have discussed nursing care of neonate which focused on establishment of respiration, providing thermo-neutral environment and maintaining body temperature, promotion of exclusive breast feeding, maternal infant bonding and providing information to parents about various components of new born care.

2.7 GLOSSARY

Anencephaly : A condition in which cranial vault is missing.
Circumcision : Excision of prepuce (foreskin) at the tip of penis.
Cleft lip : A condition with separation of upper lip on one or both sides of the midline.
Congenital : A condition present at birth.
Epispadias : A defect where urethral opening is located on the upper surface of penis.
Oesophageal atresia : A condition in which oesophageous ends in a blind pouch and is not communicated with stomach.
Haemolytic disease : A condition when Rh incompatibility between Rh negative mother and Rh positive baby occurs.
Hydrocephaly : A condition with an excessive amount of cerebrospinal fluid causing increase in size of head.
Hypospadias : A defect when urethral opening is located on the lower surface of penis.
Imperforate anus : A condition with no opening in to the rectum.
Intersex : A condition in which both male & female sex glands are present in a child.
LBW : Low birth weight baby.
Meningocele : A condition when meninges bulge out through the gap in spine (spina bifida).
Meconium : First feces of a newborn made up of salts, liquor amni, mucus, bile and epithelial cells. Greenish black to light brown in colour and almost odor less and of tarry consistency.
Microcephaly : A condition in which vault of skull is small and amount of brain tissue is less.
Myelomeningocele : A condition when meninges and spinal cord bulge out through the gap in spine.
Phimosis : A condition in which prepuce (foreskin) at the tip of penis is tight.
Rectal atresia : A condition in which rectum ends in a blind pouch and anus is absent.
Reflex : An involuntary response to a stimulus.
Spina bifida: A defect of spine in which bony part of spinal canal fails to close and a gap exists.

Squint: A condition in which eyes move independently due to eye muscle in-coordination.

Tongue tie: A condition in which a fold of mucous membrane (frenulum) under tongue is attached almost to the tip.

Tracheoesophageal fistula: A condition in which trachea communicates with esophagus.

2.8 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

1) Refer to 2.3.1.

2) Breast milk contains the exact nutrients the baby needs and promotes the baby’s development. It is easily digested and efficiently used by the baby’s body. Breast milk protects the baby from infections. Breast feeding can be used as a contraceptive method.

3) a) 24 b) sterile water. c) Infection. d) Gentioc violet or iodine compound.

4) Refer to 2.3.7.

Check Your Progress 2

1) The purposes of conducting examination at discharge are –
   a) To assess adjustment of newborn to independent life in terms of temperature maintenance, respiration and feeding.
   b) To assess breast feeding.
   c) To detect any missed anomaly.
   d) To detect occurrence of any superficial infection.
   e) To educate the mother about newborn care.

2) Sucking Reflex: Observe the baby whether it is sucking on first finger, nipple or anything else that has come in to the mouth of the infant. This is the sucking reflex response.

Rooting Reflex: Gently strike the baby’s cheek with the tip of your finger; it turns its head in that direction in search of nipple. This is the rooting reflex response.

Swallowing Reflex: Put the baby on breast (usually it is put on breast soon after birth) or place little expressed breast milk with a dropper or spoon far back on the baby’s tongue. The baby swallows it. This is the swallowing reflex response.

Moro Reflex: Observe the baby when a loud noise is made or its sheet is suddenly moved, there is drawing up of the legs and bringing the arms upwards and forwards. This is the Moro or startle reflex response.
3) Following are the nursing measures to establish respiration in newborn.
   a) Assess the cry of the baby (failure to cry may be due to obstruction of the air passage with mucous).
   b) Position on the back or the abdomen with the head lowered at 15 to 30º to facilitate mucus drainage.
   c) Keep the newborn warm.

4) (a) 36.5. (b) mucus drainage. (c) First year of life.
UNIT 3  THERMAL PROTECTION AND KANGAROO MOTHER CARE

Structure

3.0 Objectives
3.1 Introduction
3.2 Thermal Protection
  3.2.1 Definition
  3.2.2 Ways of Heat Loss in Newborn
  3.2.3 Prevention of Heat Loss
3.3 Hypothermia
  3.3.1 Definition of Hypothermia
  3.3.2 Causes of Hypothermia
  3.3.3 Stages of Hypothermia
  3.3.4 Common Situations where Cold Stress can Occur
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3.0 OBJECTIVES

After completing this unit you should be able to:

• Define Thermal protection;
• Explain the ways of loss of heat in newborns;
• Discuss the consequences of loss of heat in new born;
• Explain the hypothermia and its prevention;
• Describe the hyperthermia and its prevention; and
• Explain Kangaroo mother care.

3.1 INTRODUCTION

Newborn baby is a homeothermic, but his ability to stay warm may be easily overwhelmed by extremes of environmental temperatures. Newborn cannot
Essential Newborn Care

regulate its body temperature like an adult. The newborn gets cooled down or heated up much faster and is able to tolerate only a limited range of variation in the increased environmental temperatures. The smaller the neonate, the greater is the risk. Neonatal hypothermia continues to be a very important cause of neonatal deaths due to lack of attention by health care providers. In this unit, we will discuss various ways of heat loss and their nursing implications. This unit also highlights Hyperthermia, its prevention and Kangaroo Mother Care. Let us first discuss about Thermal Protection which is one of the important measure in newborn’s care.

3.2 THERMAL PROTECTION

3.2.1 Definition

Thermal protection is the series of measures taken at birth and during the first days of life to ensure that the newborn baby does not become either too cold (hypothermia) or too hot (hyperthermia) and maintains a normal body temperature of 36.5-37.5°C (97.7-99.5°F).

In general, newborns need a warmer environment than adults. In fact, a naked newborn exposed to a room temperature of 23°C (73.4°F) suffers the same heat loss as does a naked adult at 0°C (32°F).

| Nursing personnel who provide care to newborns need to be alert for the risk of hypothermia (temperature <36.5°C/97.7°F) which is a common condition, and of hyperthermia (temperature >37.5°C/99.5°F) which is much less frequent. Both are dangerous and may cause the death of the baby, but are easily prevented, by simple procedures, without any special equipment. |

Unlike adult the newborn is unable to regulate its temperature. Therefore, newborn needs to be protected from environmental variations of temperature and humidity.

3.2.2 Ways of Heat Loss in Newborn

You have learnt about definition of thermal protection. Now let us discuss about how newborn baby loses body heat.

There are four ways in which a newborn loses heat from the body. They are described on next page (Fig. 3.1):

Evaporation: When amniotic fluid evaporates from the skin, the heat is lost through moisture.

Conduction: When the baby is placed naked on a cooler surface, such as table, weighing scales, cold bed/sheets.

Convection: When the baby is exposed to cool surrounding air or to a draught from open doors and windows or a fan.

Radiation: When the baby cot is placed near cool objects, walls, tables, cabinets, ventilating units without actually being in contact with them.

Much of the cooling of newborn occurs during the first minutes after birth. In the first 10-20 minutes the newborn may lose enough heat for the body temperature to fall by 2-4°C (3.6-7.2°F). The body temperature can fall further in the next few hours if proper care is not given.
Understanding how a baby loses heat allows us to take effective measures to keep this heat loss to a minimum. Refer Table 3.1 for measures to minimise heat loss.

**Table 3.1: Measures to minimize heat loss**

<table>
<thead>
<tr>
<th>Methods of Heat Loss</th>
<th>Nursing Action</th>
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| **Conduction:** Heat is lost when an infant comes in contact with colder object such as cold cloth, incubator sheet, examining table etc. | • Do not allow the baby to be in pool of blood after birth and before cutting off the umbilical cord.  
• Warm up all the items that come in hands, like sheets, weighing scale, infant clothes etc.  
• Place the infant close to the mother or maintain skin-to-skin contact between mother and infant.  
• Discard the wet sheet used to wipe the infant dry after birth and replace it with another dry, warm and clean sheet. |
| **Convection:** Heat is lost by moving air currents e.g., infant who is adequately warmed but placed under the fan, near open window especially in winter months. Opening of doors and windows replaces warm air around infant with cold air. | • Do not expose the infant to increased air flow e.g., under fan, near windows, ventilator, near door which is frequently being opened.  
• Keep the infant adequately clothed including hands and feet.  
• Transport the infant in a well protected cane basket, crib by keeping hot water bottles affixed on all sides in such a way that hot water bottles do not come in direct contact with the infant.  
• Restrict the entry of people in the room where infant is kept.  
• Do not keep infant’s cot very close to the walls, window. |
| **Radiation:** Loss of heat from warm infant to cooler objects without any direct contact e.g. from infant to cold walls of the room. | • Keep the room adequately warm where mother has to deliver. |
| **Evaporation:** Heat loss by evaporation of water from wet skin. | • Dry the infant adequately of all fluid, mucus and blood soon after birth using dry, warm and clean sheet.  
• Give attention to dry the head as fast as possible.  
• Avoid over exposure of the infant during bath or sponging.  
• Do not use alcohol, cologne, spirit over the infant’s body. |
3.2.3 Prevention of Heat Loss

Thermal protection of newborns is very important and not difficult. The basic principles are the same whether the baby is born at home or in an institution. As most cooling of the newborn occurs during the first minutes after birth, it is important to act quickly to prevent heat loss.

Heat loss of newborns can be prevented by maintaining warm chain at birth and in the following hours and days. Let us discuss about warm chain and how to prevent heat loss of newborns.

The warm chain

The “Warm Chain” is a set of ten interlinked procedures carried out at birth and during the following hours and days which will minimize the likelihood of hypothermia in all newborns (Fig. 3.2). Failure to implement any one of these procedures will break the chain and put the newborn baby at risk of getting cold. The 10 steps of the “warm chain” are described below:

The Warm Chain

1) Warm delivery room
2) Immediate drying
3) Skin-to-skin contact
4) Breast-feeding
5) Bathing and weighing postponed
6) Appropriate clothing/bedding
7) Mother and baby together
8) Warm transportation
9) Warm resuscitation
10) Training and awareness raising

Fig. 3.2: Steps of warm chain.
Thermal Protection and Kangaroo Mother Care

Preventing heat loss at the time of birth: drying - wrapping - skin-to-skin - breastfeeding.

Step 1: Warm delivery room

Preparation of the place of delivery and of the supplies that will be needed at this time is the first step in the warm chain. The room should be clean, warm (at least 25-28°C/77.0-82.4°F), and free from draughts due to open windows and doors, or from fans. If the temperature of the room is less than optimal, a heater should be available to warm the room. In some circumstances, it might be easier to warm a small area of a room rather than the whole room. In hot weather, air conditioning or fans should be turned off or adjusted in the delivery room.

Supplies needed to keep the newborn baby warm should be prepared ahead of time. The supplies should include two absorbent towels large enough to cover a newborn baby’s whole body and head, a cap, a sheet or blanket for covering mother and baby, and suitable baby clothes and bedding. In cool weather, a source of heat should be available to prewarm the clothes and towels.

The delivery room temperature should be at least 25°C

Step 2: Immediate drying

After birth the baby should be immediately dried with a dry towel, including its head, while the cord is still attached. While the newborn is being dried, it should be on a warm surface such as the mother’s chest or abdomen (skin-to-skin contact), or a pre-warmed bed.

The baby should then be covered with a second dry towel (discard the first towel) and a cap put on its head. If the room temperature is less than optimal (less than 25°C/77°F), towels and cap should be pre-warmed.

Step 3: Skin-to-skin contact

Skin-to-skin contact is an effective method of preventing heat loss in newborns, whether they are full term or preterm babies. The mother’s chest or abdomen is the ideal surface to receive the newborn as it is clean and at just the right temperature. The newborn can be dried as it is lying on the mother and then covered. If skin-to-skin contact is not acceptable, the baby could be wrapped after having been dried, and placed close to the mother (Fig. 3.3).

![Fig. 3.3: Kangaroo Mother Care](image-url)
The baby should be uncovered as little as possible during assessment of its condition, during eye care, and while the cord is being tied and cut. It can be kept in skin-to-skin contact with the mother while she is being attended to (placenta delivery, suturing of tears), during transfer to the postnatal ward and for the first hours after birth. Skin-to-skin contact can also be used afterwards to keep the baby warm if the room is cool, for example at night, or to rewarm a baby that is found to be mildly hypothermic.

**Step 4: Breast-feeding**

Breast-feeding should begin as soon as possible after delivery, preferably within half an hour. An early and adequate supply of breast milk is essential to provide the newborn with calories so that it can generate body heat. The first milk, called colostrum, is rich in nutrients and antibodies, and is all the nourishment and liquid a baby needs. The baby should not be given any other food or drink. Cultural practice of considering colostrum as useless or dirty should be discouraged, families will need to be informed and convinced to feed colostrum to the baby (Fig. 3.4).

![Breastfeeding](Fig. 3.4: Breastfeeding)

In the hours and days following birth it is very important that the newborn be allowed to suckle at the breast “on demand” - that is, whenever and as long as it wishes, both day and night. This stimulates milk production and provides the baby with enough calories for heat production and for growing. A mother should receive encouragement, support, privacy and assistance for breast-feeding from family members, health staff and/or relatives.

**Step 5: Delaying Bathing and weighing**

Bathing the newborn soon after birth causes a drop in the baby’s body temperature and is not necessary. Blood, meconium and some amount of the vernix will have been wiped off during drying at birth. The remaining vernix does not need to be removed as it is harmless, may reduce heat loss and is reabsorbed through the skin during the first days of life. If cultural tradition demands bathing, this should not be carried out before 24 hours after birth, and preferably on the second or third day of life so long as the baby is healthy and its temperature is normal. Baby can be bathed daily in summer months with fan off. Baby should be dressed adequately and given breast feeding after bath. In winter months, bath should be given in warm room with doors and windows closed without undue exposure of
the baby. The water should be warm with temperature kept constant. The surface where the baby lies down for bath should not be cold. The temperature may be checked before bath, if less than 37°C do not give bath (Fig. 3.5).

Bathing in warm water followed by rapid drying leads to less heat loss than cleaning the baby with a wet towel. When bathing the baby, the midwife or birth attendant must ensure that it is done using warm water. After the bath, the baby should immediately be wrapped in a dry warm towel, dried thoroughly, dressed quickly and placed near the mother.

Weighing of the baby at birth also puts it at risk of heat loss and should be postponed. Before weighing, the baby should be well wrapped. The weight recorded can then be adjusted by subtracting the weight of the covers.

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**Step 6: Appropriate clothing and bedding**

In the first few days after birth, the newborn should be protected by clothing and bedding that is appropriate for the environmental temperature. The number of layers of clothing and bedding necessary depends on the environmental temperature. As a general rule, newborns need one or two extra layers of clothes and bedding than adults. In the initial hours after birth, clothing should always include a cap, since as much as 25% of heat loss in a newborn baby may be from an uncovered head.

Clothing and bedding should not be too tight to allow air spaces between the layers as trapped air is a very efficient insulator. Swaddling - the custom of wrapping bands tightly around the baby - is common in some cultures and should be discouraged. Swaddling excludes air and reduces the efficiency of heat retention; it restricts movement and may increase the risk of pneumonia and other acute respiratory infections because it does not allow the baby’s lungs to expand fully.
Step 7: Mother and newborn together

Babies born at home as well as in institutions should be kept with their mothers 24 hours a day, preferably in the same bed, in a warm room (at least 25°C/77°F). This is known as “rooming-in”. When mother and baby are together, it is easier to keep the baby warm and to breast-feed on demand. In institutions, rooming-in also limits the exposure of the newborn to hospital acquired infections.

When mother and baby are together it is easier to keep the baby warm and breast-feed on demand.

Step 8: Warm transportation

If the baby needs to be transferred to hospital, or to another section of a hospital such as the postnatal ward or neonatal care unit, it is important to keep the baby warm during transportation. This is a step that, if overlooked, can result in a drop of the newborn baby’s body temperature even if thermal protection measures were adequate at the time of birth. The simplest and safest way to transport most newborns is in skin-to-skin contact with the mother. Cane baskets lined with hampers for keeping hot water bottles can be used to transport newborn. The baby should be covered to prevent heat loss. Thermocol boxes, babble sheets, silver swaddler, water filled mattresses with thermostat are other alternatives that can be used to transport newborn.

Step 9: Warm resuscitation

Most newborns will start breathing spontaneously within the first minute of birth. If a newborn is not breathing after drying, it needs assistance and resuscitation must start immediately. It is very important that the baby is kept warm during this procedure since newborns with asphyxia cannot produce heat efficiently and are at increased risk of getting cold.

To keep the baby warm during resuscitation the following measures can be taken:

- Wrapping the baby in a warm blanket and laying it on a dry, warm surface, such as a warm towel or blanket; only the face and upper part of the chest should be exposed;
- Putting the baby under an additional source of heat such as a radiant heater if available; a focusing heating bulb should be used with caution as it can cause burns.

After resuscitation, the newborn’s temperature should be taken and, if necessary, the baby should be rewarmed by placing in skin-to-skin contact with the mother and helping her initiate breast-feeding as soon as possible.

Newborns with asphyxia cannot produce heat efficiently and therefore need to be kept sufficiently warm during resuscitation.
Step 10: Training and awareness raising

All health care providers involved in the process of birth and subsequent care of the newborn (physicians, midwives, maternity nurses, community health workers, traditional birth attendants) need to be adequately trained regarding the principles and procedures of the warm chain.

In institutions where equipment is used (radiant warmers, incubators for instance), there should be well trained staff to monitor the baby’s condition and the temperature of the equipment, and to clean, maintain and repair the equipment.

Families and communities need to be made aware of the importance of keeping newborns warm and be given information on how to do so.

3.3 HYPOTHERMIA

Newborn babies often develop hypothermia as they can not keep themselves warm in low environmental temperature. Hypothermia continues to be serious cause of neonatal morbidity and mortality. Timely attention given by health care providers can prevent newborn mortality due to hypothermia.

3.3.1 Definition of Hypothermia

Hypothermia occurs when the newborn’s body temperature is below 36.5°C (97.7°F), generally because the environment is too cold for the baby.

Hypothermic newborns, especially if they are sick or of low birth weight, are more at risk of developing health problems and of dying. Hypothermia is caused more by lack of knowledge than lack of equipment.

3.3.2 Causes of Hypothermia

A newborn is more prone to develop hypothermia because of a large surface area per unit of body weight. A low birth weight baby has decreased thermal insulation due to less subcutaneous fat and deficient brown fat. Brown fat is the site of heat production. It is localized around adrenal glands, kidneys, nape of neck, interscapular and axillary region. Metabolism of brown fat results in heat production. Blood flowing through the brown fat becomes warm and through circulation heat gets transferred to others parts of the body. This mechanism of heat production is called as non-shivering thermo genesis. Low birth weight babies lack this effective mechanism of heat production.

3.3.3 Stages of Hypothermia (Fig. 3.6)

- **Mild Hypothermia**: When the temperature is in the range of 36-36.4°C (96.8-97.5°F), it is mild hypothermia - cold stress.
- **Moderate Hypothermia**: When the temperature is in the range of 32-35.9°C (89.6-96.6°F), it is moderate hypothermia.
- **Severe Hypothermia**: When the temperature is in the range of less than 32°C (89.6°F), it is severe hypothermia.
3.3.4 Common Situations where Cold Stress can Occur

a) At birth – receiving in cold sheets, cold room, close proximity to open doors and windows.

b) After giving bath – cold resuscitation trolley, increased air flow.

c) During changing of nappy/ clothes, taking blood samples.

d) Malfunctioning heat source or removing the baby from heat source.

e) While transporting a sick baby.

3.3.5 Rewarming of Hypothermic Baby

A hypothermic newborn has to be rewarmed as quickly as possible. Following methods are used to rewarm the hypothermic baby:

• Skin-to-skin contact.
• A warm room or warm cot.
• A radiant warmer or an incubator.

The method, or combination of methods selected will depend on the severity of the hypothermia and the availability of staff and equipment. Infection should always be suspected because signs of infection are similar to those of hypothermia. Give parents information on how to recognize and manage hypothermia at home. Tell parents to ensure the following:

• Make sure the room is warm.
• Remove cold and wet clothes and replace with dry and warm clothes.
• Rewarm quickly by skin-to-skin contact and/or use a heating device such as, radiant heater or incubator.
• Continue breast-feeding.
• Monitor the temperature at regular intervals.
• Assess for infection.
3.3.6 Complication of Hypothermia

This includes the following:

1) Weight gain is sluggish as food is wasted for heat production rather than tissue growth.

2) Brain growth is adversely affected which is evidenced by slow increase in head size.

3) Immunological system is depressed which causes susceptibility to develop septicemia, sclerema and disseminated intravascular coagulation.

4) Predisposed to develop bilirubin encephalopathy due to elevation of non-esterified free fatty acids in the blood.

5) Due to anaerobic tissue metabolism and hypoglycemia, metabolic acidosis occurs. There is rise in serum potassium and NPN (non proteinous nitrogen) levels following tissue catabolism.

3.4 HYPERTHERMIA

We shall discuss definition and management of hyperthermia in following sub-sections:

3.4.1 Definition of Hyperthermia

Hyperthermia occurs when the newborn’s body temperature rises above 37.5°C (99.5°F) because the environment is too hot for the baby or the baby is overdressed. Always be on the alert and avoid exposing a baby to situations in which overheating may occur. Temperatures must be monitored regularly when any kind of equipment is being used to warm and/or maintain the temperature of a baby.

3.4.2 Common Causes of Hyperthermia

The hyperthermia may occur due to overclothing, overheating, hot environmental conditions or sometimes infection/fever etc.

3.4.3 Management of Hyperthermia

When a newborn baby has a raised body temperature, it is not possible to distinguish between fever and hyperthermia. Infection should therefore always be suspected first unless there is an obvious external cause for the baby becoming overheated. If there are no signs of infection and dehydration, then the probable cause is an environment that is too hot for the baby. The baby should be moved away from the source of heat (heater, sun, radiant warmer etc) and adjustments made to its clothes and bedding. The following steps may be taken to manage hyperthermia.

- Assess for infection.
- Move baby away from the source of heat and undress.
- Give baby a bath if necessary.
- Give frequent breast-feeds.
- Monitor temperature.
Methods of implementing thermal protection effectively in an institution are as follows:

- Establish a policy and set standards of practice.
- Assess existing practice, knowledge, skills and attitude of birth attendants.
- Arrange in service teaching sessions to review/revise theoretical knowledge and/or on the job training.
- Monitor practice.

Check Your Progress 1

1) What are the causes of hypothermia in newborn?

2) Mention the ways of heat loss in newborn?

3) Define hypothermia.

4) Describe the stages of hypothermia.

5) List ten steps of warm chain.
Till now you have learnt about Thermal Protection. Kangaroo mother care is also one of the most important aspect of Thermal Protection. Let us discuss about Kangaroo Mother Care. Giving newborn infants plenty of skin to skin contact with their mothers shortly after birth may ease the stressful transition from womb to world. Researchers say that the transition from the womb to the real world is one of the most hazardous and stressful events in the human life cycle. Therefore, interventions that can help a newborn feel more secure and facilitate adaptation to their new surroundings would be helpful.

### 3.5.1 Definition

Kangaroo mother care (KMC) is a special way of caring of low birth weight babies. It fosters their health and well being by promoting effective thermal control, breast feeding, infection prevention and bonding.

**The two components of KMC are as follows:**

1) **Skin-to-skin contact:**

   Early, continuous and prolonged skin to skin contact between the mother and her baby is the basic component of KMC. The infant is placed on her mothers’ chest between the breasts in her blouse. For comfort a small nappy is fine, and for warmth a cap may be used. Skin-to-skin contact should ideally start at birth, but is helpful at any time. It should ideally be continuous day and night, but even shorter periods (partial KMC) are also helpful.

2) **Exclusive breastfeeding:**

   The baby on KMC is breast fed exclusively. Skin to skin contact promotes lactation and facilitates the feeding interaction.

**Prerequisites of KMC are as follows:**

1) **Support to the mother in hospital and at home:**

   A mother cannot successfully provide KMC all alone. She would require counseling along with supervision from care providers, and assistance and cooperation from her family members.

2) **Post Discharge follow up:**

   KMC is continued at home after early discharge from the hospital. A regular follow up and access to health providers for solving problems is crucial to ensure safe and successful KMC at home.

### 3.5.2 Benefits of KMC

- **Breastfeeding:**

  Studies have revealed that KMC results in increased breastfeeding rates as well as increased duration of breastfeeding. Even when initiated late and for a limited time during day and night, KMC has been shown to exert a beneficial effect on breastfeeding. KMC stabilizes baby’s physiology and improves weight gain.
Essential Newborn Care

- **Thermal control:**
  Prolonged skin-to-skin contact between the mother and her preterm/LBW infant provides effective thermal control with a reduced risk of hypothermia. For stable babies, KMC is at least equivalent to conventional care with incubators in terms of safety and thermal protection.

- **Early discharge:**
  Studies have shown that KMC cared LBW infants could be discharged from the hospital earlier than the conventionally managed babies. The babies gained more weight on KMC than on conventional care.

- **Less morbidity:**
  Babies receiving KMC have more regular breathing and less predisposition to apnea. KMC protects against nosocomial infections. Even after discharge from the hospital, the morbidity amongst babies managed by KMC is less. KMC is associated with reduced incidence of severe illness including pneumonia during infancy. Thereby, it reduces hospital stay of mother and baby.

- **Other effects:**
  KMC helps both infants and parents. Newborn feels more secure, mothers are less stressed as compared with a baby kept in incubator. Mothers prefer skin-to-skin contact to conventional care. They report a stronger bonding with the baby, increased confidence, and a deep satisfaction that they were able to do something special for their babies.

### 3.5.3 Criteria for KMC

#### Baby

All babies are eligible for KMC. However, very sick babies needing special care may preferably be cared under radiant warmer and KMC can be started after the baby has become stable. Some guidelines for practicing KMC include:

i) **Birth weight less than 1800gm:** If stable, can be started on KMC soon after birth.

ii) **Birth weight 1200-1799gm:** In such case the delivery should take place in an equipped facility, which can provide neonatal care. Should delivery occur elsewhere, the baby should be transferred to such facility soon after birth, preferably with the mother. One of the best ways of transporting small babies is keeping them in continuous skin-to-skin contact with the mother. It may take a couple of days for a sick baby to become stable before KMC can be initiated.

iii) **Birth weight <1200gm:** These babies benefit most from transfer before birth to a hospital with neonatal intensive care facilities. It may take days to weeks before baby’s condition allows initiation of KMC.

| **KMC can be initiated in a baby who is otherwise stable but still on intravenous fluids, tube feeding and/or oxygen.** |

#### Mother

All mothers can provide KMC, irrespective of age, parity, education, culture and religion. The following aspects must be taken into consideration when counseling for KMC:
i) Willingness: The mother must be willing to provide KMC. Healthcare professionals should counsel her adequately regarding different aspects of KMC. Once mother knows about KMC, she will be willing to provide KMC to her baby.

ii) General health and nutrition: If the mother has suffered from complications during pregnancy or delivery or is otherwise ill, she should recover reasonably well before she can initiate KMC.

iii) Hygiene: The mother should maintain good hygiene i.e. daily bath / sponge, change of clothes, hand washing, short and clean finger nails.

iv) Supportive family: She needs support to deal with other responsibilities at home. The other family members e.g. father or grandmother should also be encouraged to provide kangaroo care to the LBW baby.

v) Supportive community: This is particularly important when there are social, economic or family constraints.

3.5.4 Preparing for KMC

Counseling:
When baby is ready for KMC, arrange a time with the mother that is convenient for her and her baby. The first few sessions are important and requires time and extended interaction. Ask her to wear light, loose clothing. Provide a warm place to her. Respect her requirement of privacy while providing KMC. Encourage her to bring her mother-in-law, other relatives or her husband if she wishes, as it helps to lend support and reassurance. Talk to other key family members especially mother-in-law, sister-in-law and husband. Unless they are convinced, it will not be possible for the mother to do KMC at home.

Mothers clothing:
KMC can be provided using any front-open, light dress as per the local culture. KMC works well with blouse and sari, gown or shawl. Suitable apparel that can retain the baby for extended period of time can be adopted locally.

| KMC can be provided using any front open garment. You can innovate/design a garment which would help mother to provide KMC to her baby. |

Baby clothing: Baby should be naked except for cap, socks and nappy and front-open sleeveless shirt.

3.5.5 KMC Procedure

• Explain the procedure to mother.
• Make her comfortable.

Kangaroo positioning (Fig. 3.7)

• The baby should be placed between the mother’s breasts in an upright position.
• The head should be turned to one side and should be in slightly extended position. This slightly extended head position keeps the airway open and allows eye-to-eye contact between the mother and the baby. Avoid both forward flexion and hyperextension of the head.
• The hips should be flexed and abducted in a “frog” position; the elbows should also be flexed.
• Baby’s abdomen should be at the level of the mother’s epigastrium. This way baby has enough room for abdominal breathing. Mother’s breathing stimulates the baby, thus reducing the occurrence of apnea.
• Support the baby’s bottom with a sling/ binder.
• Mother can provide KMC sitting or reclining in a bed or a chair. She can keep herself in slightly backward reclining position and support baby’s body and neck using her own hand.

![Image](image_url)

a) father providing KMC to single baby b) KMC to Twin babies.

**Fig. 3.7: (a) & (b)**

**Monitoring**
Babies receiving KMC should be monitored carefully especially during the initial stages. Nurses should make sure that baby’s neck position is neither too flexed nor too extended, airway is clear, breathing is regular, color is pink and baby is maintaining temperature. Mother should be involved in observing the baby during KMC so that she herself can continue monitoring at home.

**Remember that baby’s neck is not too flexed or too extended. Breathing is normal and feet and hands are warm.**

**Feeding**
The mother should be explained that she should breastfeed in the kangaroo position and that KMC actually makes breastfeeding easier. Furthermore, holding the baby near the breast stimulates milk production.

**Maintain Privacy**
KMC unavoidably requires some exposure on the part of the mother. This can make her nervous and could be de-motivating. The staff must respect mother’s sensitivities in this regard and ensure culturally acceptable privacy standards in the nursery and the wards where KMC is practiced.

**When mother is not available, other family members such as grandmother, father or other relative can provide KMC.**
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Time of initiation

KMC can be started as soon as the baby is stable. Babies with severe illness or requiring special treatment should wait until they are reasonably stable before KMC can be initiated. During this period babies are treated according to neonatal unit clinical guidelines. Short KMC sessions can be initiated during recovery with ongoing medical treatment (IV fluids, low concentration of oxygen). KMC can be provided while the baby is being fed via oro-gastric tube or on oxygen therapy. Once the baby begins to recover, family members should be motivated to practice KMC.

Duration of KMC

- Skin-to-skin contact should start gradually in the nursery, with a smooth transition from conventional care to continuous KMC.
- Sessions that last less than one hour should, however, be avoided because frequent handling may be too stressful for the baby.
- The length of skin-to-skin contacts should gradually be increased to become as prolonged as possible, interrupted only for changing diapers, especially where no other means of thermal control are available.
- When the baby does not require intensive care, he/she should be transferred to the postnatal ward and KMC should be continued.
- When the mother needs to be away from her baby, other family members (father, grandmother etc.) can also help by caring for the baby in skin-to-skin kangaroo position.

Remember it may not be possible for mother to provide KMC for prolonged period in the beginning. Encourage her to increase the duration each time. The aim should be to provide KMC as long as possible.

The mother can sleep with the baby in kangaroo position in a reclined or semi-recumbent position, about 15 degree from horizontal. This can be achieved with an adjustable bed, if available, or with several pillows on an ordinary bed. It has been observed that this position may decrease the risk of apnea for the baby. If the mother finds the semi-recumbent uncomfortable, allow her to sleep as she prefers and she can continue KMC as much as possible. A comfortable chair with adjustable back may be useful for resting during the day (Fig. 3.8).

Fig. 3.8: Mother can provide KMC during sleep and rest
Criteria to transfer the baby from nursery to the ward

Standard criteria of the unit for transferring baby from the nursery to the postnatal ward should be as follows:

- Stable baby.
- Gaining weight.
- Mother confident to look after the baby.

Discharge criteria

Usually, a KMC baby can be discharged from the hospital when the following criteria are met:

- The baby’s general health is good and there is no concurrent disease such as apnea or infection.
- Baby is feeding well, and is receiving exclusively or predominantly breast milk.
- Baby is gaining weight (at least 15g/kg/day for at least three consecutive days) and has regained birth weight.
- Baby’s temperature is stable in the KMC position (within the normal range for at least three consecutive days).
- The mother is confident of taking care of her baby at home and would be able to come regularly for follow-up visits.

These criteria are usually met by the time baby weighs around 1500 gm. The home environment is also very important for the successful outcome of KMC. The mother should go back to a warm, smoke-free home. She should have support for everyday household tasks.

How long to continue KMC?

When the mother and baby are comfortable, KMC is continued for as long as possible, at the institutions and at home. Babies love to be cared skin-to-skin with mothers after going home. This should be continued for some time at home and other family members can also participate in providing KMC. It can be weaned off, once the baby starts becoming intolerant to the procedure or at 40 weeks of post conceptional age.

Follow up plan

The smaller the baby at discharge, the earlier and more frequent follow-up visits would be needed. If the baby is discharged in accordance with the above criteria, the following suggestions would be valid in most circumstances:

- One follow-up visit every 2 weeks period till weight of the baby is 3 kg.
- Thereafter one follow-up per month till 6 months of age.
- One follow-up every three months till one year of age.
- More frequent visits should be made if baby is not growing well or if the condition demands.

Requirements for KMC implementation

These include the following:
• Training of nurses, physicians and other staff involved in the care of the mother and the baby.

• Educational material such as information sheets, posters, and video films on KMC in local language should be available to the mothers, families and community.

• If it is possible then, reclining chairs in the nursery and post-natal ward, beds with adjustable back rest should be arranged. Mother can provide KMC sitting on an ordinary chair or in a semi-reclining posture on a bed with the help of pillows.

• Once KMC is implemented, nurses and other staff appreciate KMC because of the health benefits to the babies and the satisfaction expressed by the mothers

• KMC does not require extra staff.

**Check Your Progress 2**

1) Mention the components of KMC.
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................

2) Describe the benefits of KMC.
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................

3) When to initiate KMC?
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................

4) How long to continue KMC?
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................
   .............................................................................................................
5) What are the requirements for implementation of KMC?

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................
........................................................................................................................................
........................................................................................................................................

3.6 LET US SUM UP

In this unit you have learnt about thermal protection and kangaroo mother care. In thermal protection we have discussed about of heat loss and prevention of heat loss. The important aspects of thermal regulation and hypothermia are also discussed in detail. Kangaroo mother care is an essential component of thermal regulation and in this unit different aspects of kangaroo mother care have been discussed in detail to improve your knowledge and understanding about thermal protection and kangaroo mother care.

3.7 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

1) Refer to 3.3.2
2) Refer to 3.2.2
3) Hypothermia occurs when the newborn’s body temperature drops below 36.5°C (97.7°F), generally because the environment is too cold for the baby.
4) Stages of hypothermia are
   36-36.4°C (96.8-97.5°F) is mild hypothermia (cold stress).
   32-35.9°C (89.6-96.6°F) is moderate hypothermia.
Less than 32°C (89.6°F) is severe hypothermia.
5) The warm chain is as follows
   – Warm delivery room
   – Immediate drying
   – Skin-to-skin contact
   – Breast-feeding
   – Bathing and weighing postponed
   – Appropriate clothing/bedding
   – Mother and baby together
   – Warm transportation
   – Warm resuscitation
   – Training and awareness raising
Check Your Progress 2

1) A) **Skin-to-skin contact:** Early, continuous and prolonged skin to skin contact between the mother and her baby is the basic component of KMC. The infant is placed on her mother’s chest between the breasts. For comfort a small nappy is fine, and for warmth a cap may be used. Skin-to-skin contact should ideally start at birth, but is helpful at any time. It should ideally be continuous day and night, but even shorter periods are still helpful.

   B) **Exclusive breastfeeding:** The baby on KMC is breast fed exclusively. Skin to skin contact promotes lactation and facilitates the feeding interaction.

2) **Breastfeeding:** Studies have revealed that KMC results in increased breastfeeding rates as well as increased duration of breastfeeding. Even when initiated late and for a limited time during day and night, KMC has been shown to exert a beneficial effect on breastfeeding.

   **Thermal control:** Prolonged skin-to-skin contact between the mother and her preterm/ LBW infant provides effective thermal control with a reduced risk of hypothermia. For stable babies, KMC is at least equivalent to conventional care with incubators in terms of safety and thermal protection.

   **Early discharge:** Studies have shown that KMC cared LBW infants could be discharged from the hospital earlier than the conventionally managed babies. The babies gained more weight on KMC than on conventional care.

   **Less morbidity:** Babies receiving KMC have more regular breathing and fewer predispositions to apnea. KMC protects against nosocomial infections. Even after discharge from the hospital, the morbidity amongst babies managed by KMC is less. KMC is associated with reduced incidence of severe illness including pneumonia during infancy.

   **Other effects:** KMC helps both infants and parents. Mothers are less stressed during kangaroo care as compared with a baby kept in incubator. Mothers prefer skin-to-skin contact to conventional care. They report a stronger bonding with the baby, increased confidence, and a deep satisfaction that they were able to do something special for their babies.

3) KMC can be started as soon as the baby is stable. Babies with severe illness or requiring special treatment should wait until they are reasonably stable before KMC can be initiated.

4) When the mother and baby are comfortable, KMC is continued for as long as possible, at the institutions and at home.

5) Training of nurses, physicians and other staff involved in the care of the mother and the baby. Educational material such as information sheets, posters, and video films on KMC in local language should be available to the mothers, families and community. If it is possible then, reclining chairs in the nursery and post natal ward, beds with adjustable back rest should be arranged. Mother can provide KMC sitting on an ordinary chair or in a semi-reclining posture on a bed with the help of pillows.
UNIT 4  BREAST FEEDING AND LACTATION MANAGEMENT

Structure

4.0 Objectives

4.1 Introduction

4.2 Anatomy and Physiology of Breast
  4.2.1 Anatomy of Breast
  4.2.2 Physiology of Lactation
  4.2.3 Composition of Breast Milk and Types of Breast Milk

4.3 Breast-feeding and Exclusive Breast-feeding
  4.3.1 Definition and Meaning
  4.3.2 Advantages of Breast-feeding
  4.3.3 Initiation of Breast-feeding
  4.3.4 Attachment and Positioning for Breast Feeding

4.4 Preparation for Successful Lactation

4.5 Problem Related to Lactation and their Management
  4.5.1 Inverted Nipples
  4.5.2 Engorgement of Breast
  4.5.3 Sore and Cracked Nipples
  4.5.4 Blocked Ducts
  4.5.5 Mastitis and Breast Abscess
  4.5.6 Not Enough Milk
  4.5.7 Refusal to Breast Feed

4.6 Expressed Breast Milk
  4.6.1 How to Express?
  4.6.2 Methods of Feeding Expressed Breast Milk

4.7 Breast Feeding in Special Situation
  4.7.1 Caesarean Section
  4.7.2 Full Term Twin Babies
  4.7.3 Cleft Lip and Cleft Palate
  4.7.4 Maternal Illness
  4.7.5 Maternal Drugs
  4.7.6 Mother is HIV Positive

4.8 Signs of Adequate Breastfeeding

4.9 Ten Steps to Successful Breastfeeding

4.10 Human Milk Banking

4.11 Let Us Sum Up

4.12 Answers to Check Your Progress

4.0 OBJECTIVES

After studying this unit, you should be able to:

- Review the anatomy and physiology of breast;
- Explain the concept of breast feeding and exclusive breast feeding;
• Demonstrate the correct technique of breastfeeding;
• Discuss the problems related to lactation and their management;
• Demonstrate the technique of expressing breast milk (EBM) and method of feeding EBM; and
• Discuss the ten steps of successful breastfeeding and human milk banking.

4.1 INTRODUCTION

In this unit you are going to review the anatomy and physiology of breast. You will understand the meaning and definition of breast-feeding. You will learn about antenatal preparation of the mother for breast-feeding, problems related to breast-feeding and their management including proper lactational management.

Breast-feeding is the important way to feed an infant. It greatly improves the quality of life by providing unique nutritional, immunological, ecological, psychological and child spacing benefits. Breast-feeding also enhances maternal health by promoting optimal involution of uterus. It also reduces the incidence of cancer breast and cancer ovary.

4.2 ANATOMY AND PHYSIOLOGY OF BREASTS

In order to impart successfully the knowledge of breast-feeding, it is necessary to review the relevant anatomy and physiology of breasts, to understand how and where the milk is produced and factors which affect lactation.

4.2.1 Anatomy of Breast (Fig. 4.1)

The breast tissue is composed of alveoli, the glands, which are small sacs, made of millions of milk secreting cells. Each breast of whatever shape/size contains these cells in sufficient numbers and the size does not affect this number. Their ducts open outside at the nipple area. While these ducts are beneath the areola, they become wider to form the lactation sinuses. It is here breast milk is temporarily stored before it flows to baby’s mouth.

Milk is produced inside the alveoli glands under the influence of prolactin (a hormone released from anterior pituitary gland in the brain). The milk flows into the ducts to be stored in the lactiferous sinuses and under the influence of oxytocin (a hormone released from the posterior pituitary gland) the muscles around the alveoli squeeze to cause ejection of milk.

![Fig. 4.1: Structure of breast](image-url)
4.2.2 Physiology of Lactation

*Milk production*

As the baby suckles on the breast it provides a sensory stimulus through nerve endings in the nipple to the anterior pituitary gland resulting in the release of prolactin. This acts on alveoli glands in the breast for milk production.

Thus, milk production is dependent on the sucking stimulus. When the baby suckles, prolactin is secreted and is present in the blood for about 30 minutes after the feed. It also makes the breast produce milk for the next feed. For the prolactin production if a baby suckles more, the mother’s breast will produce more. For the same reason if a mother has two babies, breast milk production increases due to increased suckling.

**Remember**

- More suckling produces more milk.
- More prolactin is produced at night.
- Prolactin makes a mother feel relaxed.
- Hormones, related to prolactin suppress ovulation, that is how breastfeeding helps spacing of birth.

*Milk flow*

Stimulation of sensory nerves in the nipple by suckling also induces the production of oxytocin, a hormone released from the posterior pituitary gland.

Oxytocin acts on the muscle cells around the alveoli in the breast tissue causing ejection of milk. Oxytocin reflex is stimulated quickly with start of the suckling and sometimes even the sight or thought about the baby. It is produced at the time of the feed and is responsible for milk transfer from breast to the baby. If not produced adequately, the baby may have difficulty in getting the milk. It may seem that breast is not producing milk, but in fact milk is there but not flowing.

The most important thing about oxytocin release is that it is affected by the mother’s mental state. Good feelings, thinking lovingly of her baby, feeling confident that her milk is the best and enough for her baby can help oxytocin reflex to work better. The sight of the baby and the sounds made by the baby help augment the oxytocin reflex. Negative feelings like pain, worries, lack of confidence and doubts about her ability to produce milk inhibit the reflex.

**Check Your Progress 1**

1) Oxytocin is released from .................................................................
2) Anterior pituitary gland releases ....................................................
3) Negative feeling, worries and pain inhibit .....................................

4.2.3 Composition of Breast Milk and Types of Breast Milk

Breast milk is a normal and ideal food. It contains all the nutrients that a baby needs for the first 6 months of life. It is quickly and easily digested. It contains fat, protein, lipase, lactose, salts, minerals, calcium, phosphate, iron, vitamins and water. It is species specific and contains right amounts of these substances unlike cow’s milk (Table 4.1).
Table 4.1: Comparison of Human Milk and Cow’s Milk

<table>
<thead>
<tr>
<th>Composition</th>
<th>Human</th>
<th>Cow’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterial contamination</td>
<td>None</td>
<td>Likely</td>
</tr>
<tr>
<td>Anti-infective substances</td>
<td>Antibodies</td>
<td>Not active</td>
</tr>
<tr>
<td></td>
<td>Leucocytes</td>
<td>Not present</td>
</tr>
<tr>
<td></td>
<td>Lactoferrin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bifidus factor</td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1%</td>
<td>4% (too much)</td>
</tr>
<tr>
<td>Casein</td>
<td>0.5%</td>
<td>3% (too much)</td>
</tr>
<tr>
<td>Lactalbumin</td>
<td>0.5%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Amino-acids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cystine</td>
<td>Enough for growing Brain</td>
<td>Not enough</td>
</tr>
<tr>
<td>Taurine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4% (average)</td>
<td>4%</td>
</tr>
<tr>
<td>Saturation of fatty acids</td>
<td>Enough unsaturated</td>
<td>Too much saturated</td>
</tr>
<tr>
<td>Linoleic acid (essential)</td>
<td>Enough for growing brain</td>
<td>Not enough</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>Enough</td>
<td>Not enough</td>
</tr>
<tr>
<td>Lipase to digest fat</td>
<td>Present</td>
<td>None</td>
</tr>
<tr>
<td>Lactose (sugar)</td>
<td>7% (enough)</td>
<td>3 – 4% (not enough)</td>
</tr>
<tr>
<td>Salts (mEq/L)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>6.5 (correct amount)</td>
<td>25 (too much)</td>
</tr>
<tr>
<td>Chloride</td>
<td>12 (correct amount)</td>
<td>29 (too much)</td>
</tr>
<tr>
<td>Potassium</td>
<td>14 (correct amount)</td>
<td>35 (too much)</td>
</tr>
<tr>
<td>Minerals (mg/L)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>350 (correct amount)</td>
<td>1400 (too much)</td>
</tr>
<tr>
<td>Phosphate</td>
<td>150 (correct amount)</td>
<td>900 (too much)</td>
</tr>
<tr>
<td>Iron</td>
<td>Small amount</td>
<td>Small amount</td>
</tr>
<tr>
<td></td>
<td>Well absorbed</td>
<td>Poorly absorbed</td>
</tr>
<tr>
<td></td>
<td>Enough</td>
<td>Not enough</td>
</tr>
<tr>
<td>Vitamins</td>
<td>Enough</td>
<td>May not be enough</td>
</tr>
<tr>
<td>Water</td>
<td>Enough</td>
<td>Extra needed</td>
</tr>
</tbody>
</table>

Source: King FS & Anand, RK., Helping Mother to Breastfeed, ACASH, Mumbai.

The composition of breast milk varies at different stages after birth to suit the needs of the baby. Milk of a mother who had delivered a preterm baby is different from milk of a mother who has delivered a full term baby.

Types of breast milk

Colostrum

During the first three days after delivery a woman secretes milk which is yellow, thick, sticky, contains more antibodies, vitamins (A, D, E, K), and white blood cells and is called colostrum. Although it is secreted in small quantities (30-90 mL), it is sufficient to meet the caloric needs of the newborn.
Essential Newborn Care

It is easily digestible, contains anti-infective elements to protect newborn against infection and provides the first immunization against disease that a baby may encounter after delivery. Being rich in growth factor, it stimulates the baby’s immature intestines to be able to digest and absorb milk and to prevent the absorption of undigested protein.

Colostrum has a purgative effect which helps to clear baby’s gut off meconium (the first very dark stools) and helps to prevent jaundice by clearing the bilirubin from the gut. It is also rich in vitamin K which prevents bleeding in the newborn.

**Transitional milk**

During the two weeks after the colostrum stage, the milk increases in quantity and changes in appearance and composition as per the baby’s needs, protein content decreases while fat and sugar content increases. At this time the breasts feel full, hard and heavy.

**Mature milk**

Mature milk follows transitional milk. It is thinner and watery but contains all the nutrients essential for optimal growth of the baby.

**Foremilk**

The milk which comes at the start of a feed is called foremilk. Foremilk is watery and bluish in colour, has a high content of protein, vitamins, minerals and water. It satisfies the baby’s thirst and is produced in larger amounts than hind milk. Mothers sometimes worry that their milk is too thin, but the truth is that the milk is never too thin. It is important for a baby to have both foremilk and hind milk to get a complete meal and all the water that the baby needs to satisfy the thirst.

**Hind milk**

Hind milk, which comes later in feed, is richer in fat, and this extra fat makes it look whiter than foremilk. It satisfies the baby’s hunger and supplies much of the energy of a breast feed. Therefore, it is important not to take a baby off the breast too quickly. Babies who are fed with both foremilk and hind milk sleep well and grow healthy. There is however, no sudden change from foremilk to hind milk, the fat content increases gradually from the beginning to the end of a feed.

**Remember**

The composition of breast milk changes during the phases of feeding. Therefore, the mother should allow the baby to suckle as long as s/he wants, as both the foremilk and the hind milk are necessary for appropriate weight gain.

**Preterm milk**

Milk produced by women who have delivered prematurely is called preterm milk. This milk has more protein, minerals, immunoglobulins and lactiferin than mature milk, making it more suited for the needs of a preterm baby. The lower concentration of lactose, calcium and phosphorous is best suited for survival and growth of a preterm baby. The preterm milk is ideal for the low birth weight babies.
Breast Feeding and Lactation Management

Term milk

Milk produced by a woman who has full term delivery is called term milk. This varies in composition to the milk produced by a woman who has a premature delivery. Its composition is suitable for normal term baby.

Check Your Progress 2

1) Discuss the composition of breast milk.

2) Name the types of breast milk.

4.3 BREAST FEEDING AND EXCLUSIVE BREAST-FEEDING

In this section we shall focus on various aspects of breast-feeding.

4.3.1 Definition and Meaning

Exclusive breast-feeding means that the infant receives only breast milk and no other liquids or complementary foods with the exception of undiluted drops or syrups consisting of vitamin and mineral supplements or medicine. Water is not permitted.

Exclusive breast-feeding is ideal nutrition and sufficient to support optimal growth and development for the first 6 months after birth. Babies do not need anything other than breast milk. Exclusive breast fed babies do not need water as the water requirements of infants are met with exclusive breast feeding even in very hot and dry parts of the world. Exclusive breast-feeding provides all what an infant requires.

Remember

Ensure exclusive breast-feeding during the first six months of life. Additional water is not necessary even in summer.

The advantages of exclusive breastfeeding include:

- Babies exclusively breast fed for 6 months have better development of body and brain.
Essential Newborn Care

• Breast fed babies have lower risk of respiratory and intestinal infections.

• Exclusive breast-feeding provides 98% protection for another pregnancy, if breast-feeding is continued for 6 months in those women whose menstrual periods have not returned.

• Under nourished and anaemic mothers can also successfully exclusively breast-feed their babies.

• Mothers who exclusively breast feed their babies are better adjusted with their babies as far as rearing and behavioural adjustments are concerned.

• It creates better intelligence development.

• It reduces the risk of breast and ovarian cancer.

Remember

Breast-feeding saves lives. An exclusively breast fed infant is 14 times less likely to die from diarrhoea, 4 times less likely to die from respiratory diseases and 3 times less likely to die from other infections as compared to a bottle fed infant.

4.3.2 Advantages of Breast-feeding

Breast-feeding exclusively for first six months and continued breast feeding up to 2 years and beyond provides following advantages to the baby, mother and society:

Advantages/Benefits to the Baby

• Breast fed babies have shown a higher intelligence quotient (IQ) and also better mathematical abilities.

• It enhances brain development, there is better visual development and visual sharpness leading to reading and learning readiness.

• It enhances the emotional bond between the child and the mother and provides warmth, love and affection.

• Breast fed babies are less prone to have asthma and other allergic disorders later in life.

• Breast-feeding protects the child against several infections including diarrhoea and respiratory infections and many chronic problems like hypertension, diabetes and heart disease etc.

• Breast milk contains proteins, fat, lactose, vitamins, iron, minerals and enzymes in the right amount necessary for the development of the baby.

• Iron in the breast milk is better absorbed and breast milk contains more fat-soluble vitamins like A, C, D and E.

• It also contains the growth factor that helps the baby’s intestines to develop and be able to digest and absorb milk. It contains lactoferrin that binds with iron and prevents growth of harmful bacteria.

• It is clean, free from bacteria and has antiinfective factors e.g. bifidus factors.

• It is ready to serve when the baby wants it, needs no preparation and has the right temperature.

• It is economical and free from contamination.
Advantages/Benefits to the Mother

- It reduces anemia due to reduction in postpartum bleeding and reduced blood loss because of delayed menstruation.
- Obesity is less common among breast feeding mothers, as it helps the mother regain her normal figure.
- It has a protective effect against breasts and ovarian cancers.
- Exclusive breast feeding has a contraceptive effect during first six months postnatally.
- It promotes early uterine involution due to oxytocin release.
- Mothers who exclusively breast feed their babies are better adjusted with their babies as far as rearing and behavioral adjustments are concerned.

Advantages/Benefits to the Society

- Breast-feeding lowers the health care costs by reducing illness among children and so reduces the financial burden on the family.
- Fewer sick children because of breast feeding, allows mother to attend to work more efficiently thus, proves less costly to employer.

<table>
<thead>
<tr>
<th>Remember</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast feeding is natural and normal food for the baby. It is perfect for the baby, even when the mother is ill, pregnant, menstruating or even undernourished.</td>
</tr>
</tbody>
</table>

Artificial feeding

This includes commercial infant formula, generic and home based formula. Artificial feeding means the use of non-human milk which includes infant formula, animal milk and condensed milk. These do not contain appropriate amount of proteins, fats, vitamins and minerals which the baby needs and the quality of proteins is different from that of breast milk.

<table>
<thead>
<tr>
<th>Remember</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection by breast feeding is greatest for the infants, bottle feeding makes the child refuse breast feeding.</td>
</tr>
</tbody>
</table>

4.3.3 Initiation of Breast-Feeding

The process of breast feeding should be initiated immediately after birth. For successful breast feeding, it is essential to keep the baby with the mother. The mother should be encouraged to hold, cuddle the baby immediately after birth. The dry naked baby should be given to the mother for skin to skin contact to stimulate milk flow and it helps the mother to love her baby.

Babies should start to suckle as soon as possible, preferably within half an hour of normal delivery. In case of cesarean section it may start within four hours or as early as the mother is out of the effect of anaesthesia.

The first feed should always be of mother’s milk. No prelacteal feeds should be allowed, as this inhibits the establishment of successful lactation.

- Use of pacifiers produce “nipple confusion” and increase the risk of infection, and, therefore, should be discouraged.
Essential Newborn Care

- Use of prelacteal feed e.g., cows milk, or glucose water, honey etc. given before the first breast feed, discourages the newborn to suckle on the breast.

- The baby should be fed on demand and allowed feed till satisfied, when the baby is satisfied, s/he releases the nipple.

- The baby can be given 2 hourly feed (schedule feeding) and also demand feeding.

- The baby should be fed for 10-15 minutes at each breast.

- The baby must be given feeds at night also, as the prolactin secretion is more at night.

- Every feed should be given from alternate breast. At one time feed should be given from one breast only. One breast must be emptied out fully before the second is offered so that the baby receives both foremilk and hindmilk.

<table>
<thead>
<tr>
<th>Remember</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prelecteal feeds such as honey, water, artificial milk or infant formula inhibit the lactation process, so should not be given.</td>
</tr>
</tbody>
</table>

Nipple confusion

It is difficulty in feeding from a breast after using a bottle nipple. The plastic teat touches the palate which induces sucking but its texture is different and mode of sucking from it is also different and easy. If baby sucking the teat is then put on the breast, the baby gets confused between the plastic teat and breast nipple and may actually refuse the breast. This is a serious problem and is better prevented.

Once it develops, the baby has to be taken off the bottle, mother’s confidence has to be built so that she is successful in breast feeding. It may take a baby a few days to weeks to be fully breast fed. Cup or spoon may have to be used in between.

Effective suckling

For effective milk transfer from the breast to the baby, s/he should be attached to the breast in a correct position and in the right way. Baby should take enough of areola to have lactiferous sinuses inside the mouth. Baby should suckle enough to make the mother to produce more milk. It is the suckling that controls the whole process.

The baby should take nipple as well as areola inside the mouth for transfer of maximal quantities of milk into the mouth. When the baby is well attached, s/he uses suction to pull out the breast tissue to form a teat and oxytocin makes the milk flow to lactiferous sinuses into the baby’s mouth.

Effective suckling occurs when the baby suckles with slow deep suckles and some pauses. You can see and hear the infant swallowing.

The baby leaves the breasts spontaneously when satisfieds, he/she appears relaxed, sleepy and loses interest in the breast. On the contrary an infant not satisfied at the end of the feed may be restless. He may cry or try to suckle again or continue the breast feeding for a long time.
When the nipple is touched around the mouth of the baby, the baby turns the mouth towards the stimulus and opens its mouth (rooting reflex). This indicates baby’s readiness to accept the breast. This is a method to initiate breast feeding. As the baby accepts the breasts (nipple and areola), s/he starts suckling on the breast with the movements of the tongue and lip (sucking reflex) to transfer the milk from the breast to the mouth. As the milk is transferred and collects in the mouth, it is swallowed (swallowing reflex). This swallowing reflex develops early in fetal life but its coordination with suckling occurs only at 32-34 weeks of gestation. Both mother and baby need to learn the skill of feeding.

**Remember**

The key to the successful onset of lactation is frequent and regular suckling at the breast by the baby, on demand, and in the correct position.

### 4.3.4 Attachment and Positioning for Breast Feeding

A mother can feed her baby in any comfortable position such as lying lateral position or sitting with back supported with pillows. The baby needs free access to the breasts. The baby should be held with the mother’s palm under the buttock and the leg and arm under the back of the baby; leaving the head free and at the level of the breast.

Signs of correct attachment include the following:

- Baby’s chin is close to the breast.
- Baby’s tongue is under the lactiferious sinuses and nipple against the palate.
- Baby’s mouth is wide open and the lower lip is turned outwards.
- More areola is visible above the baby’s mouth than below it.
- There should be no pain in the nipple during feeding.

If one or more signs are not present, then the child is poorly attached.

**How to Offer Breast to the Baby**

The mother should touch the baby’s skin around lips with nipple and offer whole breast as shown in Figure 4.2 wherein both areola and nipple are being offered with mother resting her fingers on her chest wall and using the first finger to form a support at the base of the breast. Figure 4.3 shows the incorrect way of attachment wherein only nipple and not areola has been taken by the baby (note that the mother is holding her breast too near to the nipple and is offering only the nipples).
While offering the breast to the baby help mother by the following means:

- Explain what might help.
- Make sure that she is comfortable and relaxed.
- Sit down yourself in a comfortable, convenient position.
- Explain how to hold her baby and show her if necessary.

The four key points are:

- Baby with his head and body straight.
- Baby with his face facing mother’s breast and his nose opposite her nipple.
- Baby with his body close to her body.
- Mother supporting his whole body.

- Show her how to support her breast.
  - With her fingers against her chest wall below her breast.
  - With her first finger supporting the breast.
  - With her thumb above (Fig. 4.4).

![Fig 4.4: Positioning](image)

- Explain or show her how to help the baby to attach.
- Touch baby’s lips with her nipple.
- Wait until baby’s mouth is opening wide.
- Move baby quickly onto her breast, aiming his lower lip well below the nipple.
- Notice how she responds and ask her how her baby’s suckling feels.
- Look for signs of good attachment.
- If the attachment is not good, try again.
Check You Progress 3

1) Define exclusive breastfeeding.

2) Enumerate the advantages of breast feeding.

3) Discuss when to initiate and begin breast feeding.

4) Describes the features of correct attachment at the breast.

4.4 PREPARATION FOR SUCCESSFUL LACTATION

The success of establishment of lactation depends on how well the mother is informed and has known the art and technique of breast-feeding, in addition to the frequency and duration of feeding. In order to maintain successful breast-feeding, the mother must be prepared in the antenatal period to avoid problems in the postnatal period.

The nurse should provide knowledge about the benefits of breast feeding. This should include anatomy and physiology of lactation, initiation of lactation and
management of common concerns and problems. As a part of preconception counseling, review the benefits of breast feeding and provide breast feeding education to all women during the prenatal period. This education should explore concerns, fears, and myths that may inhibit successful breast feeding. Interview with post natal mothers or multi-gravida mothers can help antenatal mothers to clear their fears and myths. Slide and film shows in the reception of the antenatal clinics are useful aids to educate the mothers on art and technique of breast feeding.

**Role of nurse in the promotion of breast feeding is as follows:**

- Attain knowledge about the benefits of breast feeding. This should include anatomy and physiology of lactation, initiation of lactation, and management of common concerns and problems.
- As part of preconception counseling, review the benefits of breast feeding.
- Provide breast feeding education to all women during the prenatal period. This education should explore concerns, fears, and myths that may inhibit successful breast feeding.
- Integrate culturally appropriate and sensitive information into breast feeding education programme.
- Ensure that breast feeding is initiated in the immediate postpartum period whenever possible.
- Promote non-separation of mother and baby during the postpartum period.
- Use and conduct research related to breastfeeding.
- The following should be told to the antenatal mother and recorded in the antenatal card:
  1) Exclusive breast feeding for first six months.
  2) Advantages of exclusive breast milk and dangers of bottle feeding.
  3) Technique of breast feeding.
  4) Previous breast feeding experience.
  5) Correct method and attachment and positioning.
- Answer questions and worries of the mother.
- Build her confidence and explain her that she will be able to successfully breast feed her baby.

**Examination of the nipples**

While you are discussing about breast feeding with the mother, check her nipples for protractility. Ask the mother to press the areola on either side of the nipple. This makes most nipples stand out and look longer. Let the mother try to project the nipple and areola to form a “teat”. The finding are:

- If the nipples are pulled out easily, they are protractile.
- If the nipples does not pull out but goes in deeper, then it is inverted.

The mother should be reassured that her breasts are normal in size and shape to produce enough milk for her baby. If the nipples are inverted, they should be rolled on between index finger and thumb and then, tried to be pulled out. This
Breast Feeding and Lactation Management

4.5 PROBLEMS RELATED TO LACTATION AND THEIR MANAGEMENT

In spite of the antenatal preparation, the mother may have difficulties in breast feeding. These difficulties can be:

4.5.1 Inverted Nipples

Occasionally a nipple does not protract and on attempting to pull out the nipple it goes deeper into the breast, that is inverted nipple. Fortunately true inverted nipples are rare. The nipples usually become more protractile during pregnancy and mother should be reassured that she will be able to breast fed.

Treatment of inverted nipple is started after the birth of baby. Nipple is manually stretched and rolled out several times a day. A plastic syringe (10-20 ml) can be used to draw out the nipple before every feed. The steps of use of syringe to treat inverted nipples is shown in Fig. 4.5.

Fig 4.5: Syringe method to treat inverted nipples
• Help the mother to develop confidence by explaining her that the baby suckles from the breast and not from the nipple alone. As the baby breast feeds, he/she will pull the breasts and nipple out.

• Encourage mother to give plenty of skin to skin contact and to let her baby explore her breasts.

• Help the mother to have better attachment at the breast.

• Help her to make her nipple protrude out before feeding by disposable syringe.

The steps of the procedure are as follows:

i) Cut the nozzle end of the syringe.

ii) Introduce the piston from the ragged cut side.

iii) Ask the mother to apply the smooth side of the syringe and gently pull it out and let her wait for a minute.

iv) Nipple would then protrude into the syringe. Ask the mother to slowly release the suction.

v) This would be required to be done 5 – 8 times each time before feeding. This eventually would make nipple protrude out.

vi) Inspite of this baby may not be able to suckle effectively in the first week, the mother should be helped to express her milk and feed the baby with a cup or with katori and spoon (Fig. 4.6).

Fig. 4.6: Expressing breast milk

4.5.2 Engorgement of Breast

The milk production increases during the second and third day after delivery. If the feeding is delayed or infrequent or the baby is not well positioned at the breast, the milk accumulates in the alveoli. As the production increases, the amount of milk in the breast exceeds the capacity of alveoli to store it comfortably. Such a breast becomes swollen, hard, warm and painful and is termed as an engorged breast.

Breast engorgement can be prevented by early and frequent breast feeds and correct attachment of the baby to the breast. Treatment consists of cold and hot compresses to the breast, use of well fitting bra and emptying of the breasts periodically. Mother should continue feeding every 2 hourly and express the milk after every feed. A bag of frozen peas wrapped around the breasts or
application of chilled or room temperature cabbage leaves also may be helpful. Mother may have fever which subsides within a day to two. A breast pump can also be used to express milk from the breasts.

4.5.3 Sore and Cracked Nipples

If the baby is not attached well to the breast, and baby who sucks only at the nipples does not get enough milk, so s/he sucks more vigorously resulting in a sore nipple. Pulling the baby off the breast while s/he is still suckling and frequent washing with soap and water also result in cracked nipples. Oral thrush in the baby’s mouth, when the baby is few weeks old, can also be a cause.

Treatment of sore nipples consists of correct positioning and proper attachment of the baby to the breast. Hind milk can be applied to the nipple after a feed and nipple should be exposed to air and sun as much as possible. Mother should not wash the breast each time before and after feed.

Remember
Attention should be paid towards teaching the correct breast feeding positions to the mother immediately after birth to prevent soreness and cracking of nipples. Medicated cream should be avoided.

4.5.4 Blocked Ducts

If the baby does not suckle well on a particular segment of the breast, the thick milk blocks the lactiferous ducts leading to painful hard swelling. This blocked duct is not associated with fever. This can occur due to inadequate emptying of the breasts, poor positioning for feeding or wearing of very tight bra. Treatment is to encourage the mother to breast feed as often and as long as her infant is willing with no restrictions, including night feeds. Apply warm compresses on the affected area of the breast and massage the breasts using a firm movement of the thumb. Treatment requires removal of milk and avoiding any obstruction to milk flow.

4.5.5 Mastitis and Breast Abscess

This occurs commonly by the bacteria normally present in the baby’s mouth (staphylococcus aureus) and predisposing factors are cracked nipples, plugged/blocked ducts, breast trauma and maternal exhaustion. The breasts become red hot, tender and swollen. Mastitis must be treated promptly and adequately. If treatment is delayed or incomplete, recovery is less satisfactory. There is an increased risk of forming breast abscess and relapse of breast abscess may occur without mastitis also.

Treatment of mastitis includes supportive counselling, effective milk removal, antibiotic therapy and symptomatic treatment.

Supportive counselling

Mastitis is painful and frustrating condition and it makes mother feel very sick. In addition to effective treatment and control of pain, a mother needs emotional support. She may have received conflicting advices from health professionals. She may have been advised to stop breast-feeding or given no guidance either way. She may be confused and anxious and unwilling to breastfeed.
She needs reassurance about the value of breastfeeding, i.e. it is safe to continue; that milk from the affected breast will not harm her infant. She needs to be helped to express milk from the affected breast. She needs follow up to give continuing support and guidance until she has recovered fully.

**Effective milk removal**

This is the most essential part of the treatment. Antibiotic and symptomatic treatment may make the mother feel better temporarily, but unless milk is removed, the condition does not improve rather relapse may occur despite the antibiotics.

The mother must be helped to improve her baby’s attachment at the breast. Encourage frequent breast feeding as often and as long as the baby is willing. If needed milk can be expressed by hand or breast pump until the breastfeeding can be resumed.

**Antibiotic therapy**

Antibiotic treatment is indicated if either laboratory tests indicate infection, symptoms are severe or nipple fissure is visible or symptoms do not improve after 12-24 hrs of improved milk removal. Culture of the milk from the affected breast will provide the guideline for effective antibiotic therapy.

**Symptomatic treatment**

Pain should be treated with an analgesic and bed rest is given. Helping the women to rest in bed with the infant is a useful way to increase the frequency of breast feeds and thus, improve milk removal. Other measures are application of warm, wet fomentation to the breast which would relieve pain as well as help in flow of milk. Mother may be given lots of fluids to drink. Breast feeding should be restarted from the infected breasts as soon as possible. Incision and drainage may be required if breast abscess develops.

**4.5.6 Not Enough Milk**

One of the commonest reason for introducing supplementary milk early or even stopping breastfeeding is that mothers believe that they are not producing enough milk. Mothers often worry about the amount of breast milk they produce as early as the first day after delivery. Sometimes relatives, friends or health workers suggest to the mother that she may not have enough milk. These type of comments lowers the mother’s confidence in her ability to meet the baby’s needs. This problem is common all over the world in all communities.

Massaging the back may be useful to stimulate lactation. Back massages are helpful in relaxation of mother thus, stimulating hormone production. You should demonstrate the technique of massage to the relatives who can provide it to the mother. Massage should be provided for 15-20 minutes, 3-4 times/day.

Not enough milk problem or low milk transfer usually occurs due to temporary unresponsiveness of the mother’s let down reflex rather than a low milk supply.

**Remember**

Almost all mothers can produce enough breast milk for one or even two babies, provided the babies suckle effectively and breastfeeds are given as often as needed and the mother is fully confident.
Mothers who believe that they do not have enough milk need help and support of skilled person. Table 4.2 shows the reason why a baby may not get enough breast milk.

### Table 4.2: Reasons why a baby may not get enough breast milk

<table>
<thead>
<tr>
<th>Breastfeeding Factor</th>
<th>Mother: Psychological Factors</th>
<th>Mother Physical Condition</th>
<th>Baby’s Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delayed start</td>
<td>Lack of confidence</td>
<td>Illness</td>
<td>Illness</td>
</tr>
<tr>
<td>Feeding at fixed times</td>
<td>Worries, stress</td>
<td>Pain</td>
<td></td>
</tr>
<tr>
<td>Infrequent feeds</td>
<td>Unwilling for breastfeeding</td>
<td>Smoking</td>
<td></td>
</tr>
<tr>
<td>No night feeds</td>
<td>Tiredness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short feeds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor attachment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of bottles, pacifiers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offering other fluids (water, tea)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These do not affect the breast milk supply:

- Age of mother
- Sexual activity
- Menstruation
- Age of baby
- Cesarean section
- Preterm delivery
- Simple, ordinary diet
- Many children
- Size of the breasts

### 4.5.7 Refusal to Breast-Feed

Refusal or reluctance of young infant to breastfeed adequately is also one of the common reasons for stopping breastfeeding. It can often be overcome.

Some reasons along with possible solutions are suggested below in Table 4.3.

### Table 4.3: Reasons and Solutions for refusal to breast feed

<table>
<thead>
<tr>
<th>Reasons</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>The baby is ill, in pain or sedated</td>
<td>treat the baby’s illness.</td>
</tr>
<tr>
<td>If the baby is unable to suck</td>
<td>the mother needs to express and feed by using katori and spoon or a cup.</td>
</tr>
<tr>
<td>If the baby is in hospital</td>
<td>the mother should stay in the hospital in order to breastfeed.</td>
</tr>
<tr>
<td>If the nose is blocked</td>
<td>explain to the mother how to clear a blocked nose.</td>
</tr>
<tr>
<td>Feeding from a bottle or sucker on a pacifier</td>
<td>stop using bottle, sucker.</td>
</tr>
</tbody>
</table>
Check Your Progress 5

How will you help the mother in the following problems related to breast feeding:

1) Inverted nipples

2) Engorgement of breast

3) Sore and cracked nipples

<table>
<thead>
<tr>
<th>Problems</th>
<th>Support and help mother for correct attachment and positioning the mother to relieve engorgement from the breast.</th>
<th>Feed the baby 8 or more times in the day and at night.</th>
<th>Mother should be provided rest, privacy and peaceful atmosphere to feed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not getting enough milk because of poor attachment or breast engorgement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restriction of breastfeeds to certain times</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A change such as separation from mother, a new care giver or change in family routine or even the mothers smell can upset the baby and cause refusal to breastfeed</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.6 EXPRESSED BREAST MILK

All the mothers should learn the technique of expressed breast milk antenatally and practise soon after birth.

Uses of expressed breast milk are as follows:

- Feed a low birth weight or sick baby.
– Relieve engorgement.
– Relieve blocked ducts.
– Maintain the milk supply when the mother is ill.
– Relieve leaking breasts.
– Leave milk when the mother goes out.
– Feed a baby while he learns to suck from inverted nipples.
– Feed preterm baby who has difficulty in coordinating sucking and swallowing reflex.

4.6.1 How to Express?
In order to effectively express the milk, the oxytocin reflex should be stimulated by the following:
– Help the mother psychologically.
– Build her confidence.
– Try to reduce pain and anxiety.
– Help her to have good thoughts and feelings.
– She should hold the baby in her lap with skin to skin as well as eye to eye contact.

Procedure
1) Make the mother sit in a quite place and ensure privacy.
2) For expression of milk the mother should wash her hands thoroughly and sit or stand comfortably holding a clean container near the breast. Avoid using stainless steel containers as the cellular content sticks to the walls. Preferably use glass.
3) Warm the breast with warm compress.
4) Hold the breast using both the hands forming a circle around the breasts and massage the breast gently towards the nipple and stroking the nipple and areola gently with fingertips or gently rolling a closed fist over the breast.
5) Back massage may also help in the expression of milk.
6) With the thumb above and four fingers below the nipple, press the breast towards the ribs so that the lactiferous sinuses beneath the areola are compressed.
7) Pressure should be alternately given and released till the flow of milk starts. If this procedure is painful, it is likely that the technique is wrong.
8) Pressure should be given to all the sides to ensure expression from all segments of the breast. The breast should be expressed for at least 3-5 minutes until the flow slows, then express the other side and repeat alternatively. Continue till milk stops flowing.
9) To express milk adequately it takes 20 to 30 minutes.
10) Expressed breast milk can be stored in a cup, glass, jug or jar with wide mouth and a cover. The EBM can be stored in refrigerator for up to 24 hours, deep freezer for up to 6 months to one year. The stored EBM can be thawed before use at room temperature.
11) Expressed breast milk can be stored at the room temperature for 8 hours.
Use of breast pump

Breast pumps are of limited necessity and are potentially damaging to the women’s self-confidence. Over recommendation of breast pump has resulted in women not learning the basic skill of hand expression.

The pump is a special glass tube with a rubber bulb at one end. The other end of the tube is wide to fit over the nipple. Breast pump functions as under:

- Compress the rubber bulb to push on the air.
- Place the wide end of the tube over the nipple.
- Make sure that the glass touches the skin all around, to make an airtight seal around areola.
- Release the bulb. The nipple and areola are sucked into the glass.
- After you have compressed and released a few times, milk starts to flow. The milk collects in the protrusion on the side of the tube.
- Release the seal to empty the milk, and start again.

Electric pumps

They are more useful and suitable for hospitals. However, breast pumps can carry infection, especially when more than one women is using the pump. Hence, it is important for every women to learn to express their milk by hand.

4.6.2 Methods of Feeding Expressed Breast Milk

Paladai feeding:

i) Put the baby on the breast for non-nutrition sucking.

ii) Hold the baby in upright position and take the required amount of expressed milk in the paladi (Fig. 4.7).

iii) Offer the paladi by the side of the lips, it prevents spillage. Baby will actually swallow the milk.

iv) Repeat the process until the required amount has been fed.

Fig.4.7: Paladai Feeding
**Katori or cup and spoon feeding**

i) Cup or katori should be cleaned with soap and water if boiling is not possible.

ii) Cups are less likely to get contaminated than bottle, hence using cup is far better. Babies who are low birth weight cannot suck at the breast and may be given expressed breast milk by oro-gastric tube (Fig. 4.8).

![Fig.4.8: Cup Feeding](image)

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**Check Your Progress 6**

1) What is expressed breast milk?
   
2) What are the methods of feeding expressed breast milk?

---

**4.7 BREAST FEEDING IN SPECIAL SITUATION**

The newborn should be breastfed normally within half an hour of delivery. Initiation of breast feeding will depend upon the maternal and neonates condition, type of anaesthesia used and other related factors.

As soon as the mother feels fit to breastfeed and the baby is doing well, breastfeeding should be encouraged. As far as possible the mother and the baby should be put together.
4.7.1 Caesarean Section

Many mothers after caesarean delivery find it difficult to feed their babies, due to pain at the suture line and I/V lines etc. Each mother needs to experiment to find out the positions that seems best to her. The following are considered:

- Side lying positions where mother and baby lie on the sides facing each other (Fig. 4.9).
- The cradle hold with the mother sitting up in bed or chair and baby faces mother’s chest horizontally while resting on a pillow covering mother’s abdomen.
- Some mothers find it more comfortable to breastfeed in a chair with back supported than in bed.
- Whatever position the mother uses, make sure that the baby faces the mother, gets attached and suckles in correct position.
- Extra pillows and rolled up baby blankets or towels may add to a mother’s comfort in early days.

Fig. 4.9: Breastfeeding in special conditions.

4.7.2 Full Term Twin Babies

Reassure the mother that she can produce enough milk for both the babies and educate her that increased suckling will induce more production of milk. Help her to discover the best method of feeding (Fig.4.10). She can feed both the babies simultaneously or feed them one after the other. The family support is essential. The feeding should be so managed that the smaller weight baby gets more time and is fed first.

Fig. 4.10: Feeding Twins
4.7.3 Cleft Lip and Cleft Palate

Breast feeding is difficult in babies with cleft lip and cleft palate. Some babies with cleft palate learn to breast feed, especially if the mother is encouraged. The baby is breastfed in an upright sitting position. Other babies may need to be fed breast milk with cup and spoon or tube feeding.

4.7.4 Maternal Illness

Most common illnesses do not require discontinuation of breast feeding. Breast feeding is recommended even in mothers with mastitis, breast abscess and various infectious illness such as UTI, TB, Hepatitis and other Viral infections. In some of the psychiatric illnesses breast feeding may not be allowed.

4.7.5 Maternal Medication

Most of the drugs are safe, stopping breastfeeding may be more harmful than the drug themselves. Cytotoxic drugs like Cyclophosphamide, Methotrexate and Doxorubicine may interfere with cellular metabolism of the nursing mother and infant. Hence, are incompatible with breastfeeding. Radioactive compounds like gallium67, Indium111, Iodine 131 etc. may lead to secretion of radioactive substance in breastmilk.

4.7.6 Mother is HIV Positive

If the mother is HIV positive, advice the mother regarding her feeding options, and respect and support the mother’s choice. Allow the mother to make an informed choice about the breast feeding options for her baby. Explain to the mother that breast feeding carries an increased risk of transmitting HIV to the baby after birth. Inform the mother about her options for feeding, the advantages, and the risks. The mother can choose to use following options:

- Give replacement feeding if this is acceptable, affordable, feasible, sustainable, and safe. Explain to the mother that replacement feeding often carries a higher risk of infant mortality than breast feeding, especially if it cannot be prepared safely, is not continuously available and affordable to the family, and there are limited facilities and water available for preparation.
- Exclusively breast feed for 6 months and then, continue breast feeding while starting complimentary feeding after 6 months of age.
- Help the mother to assess her situation. Help her decide whether to breast feed or give replacement feeding.

4.8 SIGNS OF ADEQUATE BREASTFEEDING

- Baby passes urine 6-8 times in 24 hours.
- Goes to sleep for 2-3hrs after the feeds.
- Gains 20-30g per day after day 3-5 of life.
4.9 TEN STEPS TO SUCCESSFUL BREASTFEEDING

Every facility providing maternity services and care for newborn infants should do the following:

1) Have a written breastfeeding policy that is routinely communicated to all health care staff.
2) Train all health care staff in skills necessary to implement this policy.
3) Inform all pregnant women about the benefits and management of breastfeeding.
4) Help mothers initiate breastfeeding within half-hour of birth.
5) Show mothers how to breastfeed, and how to maintain lactation even if they are separated from their infants.
6) Give newborn infants no food or drink other than breast milk, unless medically indicated.
7) Practice rooming in. Allow mothers and infants to remain together 24 hours a day.
8) Encourage breastfeeding on demand.
9) Give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding infants.
10) Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

4.10 HUMAN MILK BANKING

For those infants who cannot be breastfed but who also cannot survive except being on human milk, banked donor milk is critically important. The human milk banking association of Northern America (HMBANA) has established annually reviewed guidelines for the operation of donor human milk with banks.

Donor milk banks collect, screen, process and distribute the milk donated by breast feeding mothers who are feeding their own infants and expressing few ounces extra each day for the milk bank. All donors are screened both by interview and serological tests for communicable disease. Banked milk is dispensed by prescription and fee is charged by bank to pay the processing cost of the milk.

Breast milk can be refrigerated safely for 48 hr after it is expressed. It can be frozen at 0°C for 6 months, and milk can be stored at –20°C for 24 hours. When storing breast milk, the container should be dated and the oldest milk should be used first.

Frozen milk is thawed by placing the container in warm water or at room temperature. It cannot be refrozen and should be used within 24 hrs. After thawing the container should be shaken to mix the layers that have separated. It is never thawed in microwave or by any other heating method.

The concept of human milk banking is operational in some parts of India also. In many of these units this milk is used for feeding preterm babies.
**4.11 LET US SUM UP**

In this unit we have reviewed the anatomy and physiology of breast feeding. Firstly, we have learnt about exclusive breast feeding for which the preparation should start in the antenatal period. We have also got an insight into the problems related to breast milk and their management. At last we also got aware of the baby friendly hospital initiative and human banking in order to promote effective breast feeding.

**4.12 ANSWERS TO CHECK YOUR PROGRESS**

**Check Your Progress 1**

1) Posterior Pituitary
2) Prolactin
3) Milk Production

**Check Your Progress 2**

1)

<table>
<thead>
<tr>
<th>Composition</th>
<th>Human</th>
<th>Cow’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterial contamination Anti-infective substances</td>
<td>None Antibodies Leucocytes Lactoferrin Bifidus factor</td>
<td>Likely Not active Not present</td>
</tr>
<tr>
<td>Protein</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casein</td>
<td>1%</td>
<td>4% (too much)</td>
</tr>
<tr>
<td>Lactalbumin</td>
<td>0.5%</td>
<td>3% (too much)</td>
</tr>
<tr>
<td>Amino-acids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cystine</td>
<td></td>
<td>Not enough</td>
</tr>
<tr>
<td>Taurine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4% (average)</td>
<td>4%</td>
</tr>
<tr>
<td>Saturation of fatty acids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linoleic acid (essential)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cholesterol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lipase to digest fat</td>
<td>Present</td>
<td>None</td>
</tr>
<tr>
<td>Lactose (sugar)</td>
<td>7% (enough)</td>
<td>3 – 4% (not enough)</td>
</tr>
<tr>
<td>Salts (mEq/L)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>6.5 (correct amount)</td>
<td>25 (too much)</td>
</tr>
<tr>
<td>Chloride</td>
<td>12 (correct amount)</td>
<td>29 (too much)</td>
</tr>
<tr>
<td>Potassium</td>
<td>14 (correct amount)</td>
<td>35 (too much)</td>
</tr>
<tr>
<td>Minerals (mg/L)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>350 (correct amount)</td>
<td>1400 (too much)</td>
</tr>
<tr>
<td>Phosphate</td>
<td>150 (correct amount)</td>
<td>900 (too much)</td>
</tr>
<tr>
<td>Iron</td>
<td>Small amount Well absorbed Enough</td>
<td>Small amount Poorly absorbed Not enough</td>
</tr>
<tr>
<td>Vitamins</td>
<td>Enough</td>
<td>May not be enough</td>
</tr>
<tr>
<td>Water</td>
<td>No extra needed</td>
<td>Extra needed</td>
</tr>
</tbody>
</table>
2) The types of breast milk are:
- Colostrum
- Transitional Milk
- Mature milk
- Fore milk
- Hind milk
- Preterm milk
- Term milk

Check Your Progress 3
1) Refer subsection 4.3.1
2) Breast fed babies have shown a higher intelligence quotient (IQ) and also better mathematical abilities.
   - It enhances brain development, better visual development and visual sharpness leading to reading and learning readiness.
   - It enhances the emotional bond between the child and the mother and provides warmth, love and affection.
   - Breast fed babies are less prone to have asthma and other allergic disorders later in life.
   - Breastfeeding protects the child against several infections including diarrhoea and respiratory infections and many chronic problems like hypertension, diabetes and heat disease etc.
   - Breast milk contains proteins, fats, lactose, vitamins, iron, minerals and enzyme in the right amount that is necessary for the development of the baby.
   - Iron in the breast milk is better absorbed and breast milk contains more water-soluble vitamins like A, C, D and E.
   - It also contains the growth factor that helps the baby’s intestines to develop and be able to digest and absorb milk. It contains lactoferin that binds with iron and prevents growth of harmful bacteria.
   - It is clean, free from bacteria and has antinfective factors e.g., bifidus factors.
   - It is ready to serve when the baby wants it, needs no preparation and has the right temperature.
   - It is economical and free from contamination.
3) The process of breastfeeding should be initiated immediately after birth for successful breastfeeding. It is essential to keep the baby with the mother. The mother should be encouraged to hold, cuddle the baby immediately after birth. The dry naked baby should be given to the mother for skin to skin contact to stimulate milk flow and help the mother to love baby.
4) Signs of correct attachment include:
   - Baby’s chin is close to the breast.
• Baby’s tongue is under the lactiferious sinuses and nipple against the palate.
• Baby’s mouth is wide open and the lower lip is turned outwards.
• More areola is visible above the baby’s mouth than below it.
• There should be no pain in the nipple during breastfeeding.

Check Your Progress 4
1) The following should be told to the antenatal mother and recorded in the antenatal card:
   1) Exclusive breastfeeding for first six months.
   2) Advantages of exclusive breast milk and dangers of bottle feeding.
   3) Technique of breastfeeding.
   4) Correct method and attachment and positioning.
   5) Previous breastfeeding experience.
   6) Answer questions and worries of the mother.
   7) Build her confidence and explain her that she will be able to successfully breast feed her baby.

Check Your Progress 5
1) Refer Sub-section 4.5.1
2) Refer Sub-section 4.5.2
3) Refer Sub-section 4.5.3

Check Your Progress 6
1) Refer Section 4.6
2) Refer Sub-section 4.6.2