THERMAL PROTECTION

The thermal protection module is designed to complement pre-service and in-service education of nursing personnel involved in care of newborns.

LEARNING OBJECTIVES

After going through this module, participants will be able to:

- Enlist the factors which contribute to heat loss and know, how they can be prevented
- Teach the mother how to keep her baby warm after birth and at home
- Plan appropriate nursing interventions for a baby experiencing hypothermia
- Explain what is hyperthermia and how to prevent it

MODULE CONTENTS

The module includes following elements:

- **Text material**: Easy to read format for quick reproduction and essential reference material for the participants. Key messages are highlighted in the boxes.
- **Case studies**: Simple cases which involve nursing interventions related to thermo regulation.
- **Oral drill**: You will learn assessment of temperature in normal and hypothermic baby and steps to be undertaken as a nurse caring for the baby to maintain temperature.
- **Role-play**: Observe steps to keep baby warm in postnatal ward. Participants will also be provided with an opportunity to do role play.
- **Self-evaluation**: At the end of text, self evaluation based on what has been learnt is included. If you need to recapitulate, feel free to refer to text material.

1. IMPORTANCE OF TEMPERATURE REGULATION

Warmth is one of the basic needs of a newborn baby. It is critical for the baby’s survival and wellbeing. Unlike adults, newborn babies are often not able to keep themselves warm especially if the environmental temperature is low. This results in low body temperature or hypothermia.

**Even normal, well babies need care to avoid becoming too cold or too hot. A sick or preterm newborn infant is more likely to die if she is hypothermic**

2. HANDICAPS OF NEWBORN IN TEMPERATURE REGULATION

A newborn is more prone to develop hypothermia because of a large surface area per unit of body weight. In addition, Low Birth Weight (LBW) babies have decreased thermal insulation due to less subcutaneous fat and decreased heat production due to lack of energy brown fat.

Brown fat is the site of heat production. It is localized around the 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 transfers heat to other parts of the body. This mechanism of heat production is called ‘non shivering thermogenesis’. LBW babies lack this effective mechanism of heat generation.

**Why are newborn prone to develop hypothermia?**

- Larger surface area
- Decreased thermal insulation due to lack of subcutaneous fat
- Less amount of brown fat
3. CONSEQUENCES OF HYPOTHERMIA
The body cannot function well when it is cold. Being too cold means that the baby has to use a lot of energy to keep himself warm. A cold baby:

- is less active
- does not breastfeed well
- has a weak cry
- has respiratory distress

A small preterm baby who is cold (hypothermic) is also at increased risk of becoming hypoglycemic. If the baby continues to be cold, these symptoms become more severe and eventually the baby might die.

4. MECHANISM OF HEAT LOSS AND HEAT GAIN
It is very easy for a baby to get cold especially at the time of delivery when the baby is wet with amniotic fluid. The temperature inside the mother’s womb is 38°C; once the baby is born it is in a much colder environment and hence starts to lose heat immediately.

Baby's temperature is influenced by the surrounding environment. Baby gains heat in a warm environment and loses heat in a cold environment. Baby can loose warmth when baby is wet (by evaporation), lying on cold surface (by conduction), is exposed to draught of cold air (by convection) or is surrounded by cold surfaces like walls (by radiation). Similarly baby can gain heat when lying on warm surface (by conduction), is surrounded by warm circulating air as in an incubator (by convection) or lying under a warm heat source of radiant warmer (by radiation).

---

**Figure 1: Mechanisms of heat loss**

**Prevention of heat loss**
Continue initial skin-to-skin care for at least one hour after birth whenever possible
Avoid exposure of cold air and contact with wet or cold surfaces.

**Maintain normal temperature when skin-to-skin care is not being used**
Clothe and wrap in a clean, dry blanket, and cover the head.

The steps of prevention of heat loss are summarized in Figure 2.
Evaporation: Involves the loss of heat when a liquid is converted to a vapour.

**DRYING AT BIRTH**

Nursing implication
- Keep infant dry
- Remove wet nappies
- Minimize exposure during baths

Conduction: Involves the loss of body heat to cooler objects which come in direct contact with baby's skin.

**WEIGHING AT BIRTH**

Nursing implication
- Put the baby on prewarmed sheet
- Cover weighing scales and X-ray cassettes with warm towel or blanket

Radiation: Involves loss of infant's body heat to cooler solid objects that are not directly in contact with him.

**BABY INSIDE THE ROOM**

Nursing implication
- Keep baby cot away from cold outside walls, almirah
- Maintain room temperature at 25°C
- Cover the baby if stable

Convection: Involves the flow of heat from the body surface to cooler surrounding air or to air circulating over body surface.

**INCUBATOR WITH HUMIDIFICATION**

Nursing implication in newborn care unit
- Avoid air current
- Manage babies inside incubator, if possible
- Organize work to minimize opening portholes
- Provide warm humidified oxygen

**Figure 2: Prevention of heat loss in newborn**
Demonstration

Place a naked wet doll on the table. Discuss the four ways a baby can lose heat and demonstrate how to prevent them.
5. TEMPERATURE RECORDING

Normal temperature in a newborn is 36.5°C-37.5°C.

Accurate temperature recording is needed if a baby is:
- Preterm/low birth weight or sick
- Admitted to hospital for any reason
- Suspected of being either hypothermic or hyperthermic (too hot)
- Being re-warmed during the management of hypothermia
- Being cooled down during the management of hyperthermia

A temperature taken in the axilla (under the arm in the arm pit) is one of the safest methods of taking a baby’s temperature. Using a thermometer to measure temperature is more exact than feeling the skin to estimate if a baby is too hot or too cold.

5.1 Axillary temperature

Axillary temperature is as good as rectal temperature but much safer (less risk of injury or infection). It is recorded by placing the bulb of thermometer against the roof of dry axilla free from moisture. Baby’s arm is held close to the body to keep thermometer in place. The temperature is read after three minutes.

The steps of axillary temperature recording are summarized in the box below. When using an electronic thermometer temperature is read when beep is sounded.

**Steps:**
1. Wash your hands before taking a baby’s temperature
2. Keep the baby warm throughout the procedure. He/she does not need to be in a special position for the temperature to be taken
3. Make sure that the thermometer is clean.
4. Shake mercury thermometer, so that it reads less than 35°C.
5. Place the silver/red/bulb end of the thermometer under the baby’s arm in the middle of the armpit after drying.
6. Gently hold the baby’s arm against the body.
7. Keep the thermometer in place for 3 minutes.
8. Remove the thermometer and read the temperature. DO NOT add 0.5°C or 1°C to this.
9. Keep thermometer in a sterile dry container after cleaning from stem to bulb with spirit
10. Record the temperature in the baby’s case notes.

**Figure 3: Axillary temperature in newborns**

<table>
<thead>
<tr>
<th>Temperature Level</th>
<th>Cause for concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal range</td>
<td></td>
</tr>
<tr>
<td>37.5°C</td>
<td></td>
</tr>
<tr>
<td>Mild hypothermia (Cold Stress)</td>
<td>Danger; warm baby to bring up the temperature</td>
</tr>
<tr>
<td>36.5°C</td>
<td></td>
</tr>
<tr>
<td>Moderate hypothermia</td>
<td>Outlook grave; skilled care urgently needed</td>
</tr>
<tr>
<td>36.0°C</td>
<td></td>
</tr>
<tr>
<td>Severe hypothermia</td>
<td></td>
</tr>
<tr>
<td>32.0°C</td>
<td></td>
</tr>
</tbody>
</table>
Module 2 - Thermal Protection

DEMONSTRATION

The facilitator will conduct a demonstration on 'Recording the axillary temperature with a thermometer'.

VIDEO

The facilitator will conduct a demonstration on 'Recording the axillary temperature with a thermometer'.
5.2 **Rectal temperature**

Do not use this method for routine monitoring. However, it can be used as a guide for core temperature in cold (hypothermic) sick neonates. It is recorded by inserting the greased bulb of the special thermometer backwards and upwards to a depth of 3 cm in a term baby (2 cm in a preterm baby). Keep thermometer in place at least for 2 minutes.

**Rectal temperature is not recorded as a routine procedure in neonates; record rectal temperature only for a sick hypothermic newborn**

The difference in rectal and axillary temperatures is not significant.

5.3 **Skin temperature**

Skin temperature is recorded by a thermister. The probe of the thermister is attached to the skin over upper abdomen. The thermister senses the skin temperature and displays it on the panel.

5.4 **Using digital thermometer**

This is used using same steps as mercury thermometer except that

(i) remember to ON the thermometer prior to placing the same in axilla
(ii) read the temperature when the beep is sounded.

6. **ASSESSMENT OF TEMPERATURE BY TOUCH**

Baby's temperature can be assessed with reasonable precision by touching his/her abdomen, hands, and feet with the dorsum of your hand. Mother's can be trained to identify, when her baby is at risk of hypothermia by touching the extremities.

When feet are cold and abdomen is warm, it indicates that the baby is in cold stress. In hypothermia, both feet and abdomen are cold to touch.

**In normothermic baby (baby with normal temperature), both abdomen and feet are warm to touch**

7. **WARM CHAIN**

The "warm chain" is a set of interlinked procedures carried out at birth and later which will minimize the likelihood of hypothermia in all newborns. Baby must be kept warm at the place of birth (home or hospital) and during transportation from home to hospital or within the hospital. Satisfactory control of baby's temperature demands both prevention of heat loss and providing extra heat using an appropriate source.

7.1 **Common situations where cold stress can occur**

i. At birth
ii. During and after giving bath
iii. During changing of nappy/clothes
iv. Malfunctioning heat source or removing the baby from heat source
v. While transporting a sick baby
Module 2 - Thermal Protection

7.2 Steps to prevent heat loss in labor room
   i. Keep delivery room warm (25°C)
   ii. Newborn care corner temperature to be maintained at 28°C-30°C
   iii. Drying immediately. Dry with one towel. Remove the wet towel and cover with another pre-warmed towel
   iv. Skin-to-skin contact between mother and baby
   v. Ensure baby is kept on mother's chest or abdomen, well covered with cloth and head covered with cap

7.3 Steps to prevent heat loss in postnatal ward
   i. Promote breast feeding
   ii. Appropriate clothing, cover head and extremities
   iii. Keep mother and baby together
   iv. Keep the room warm 25°C-28°C
   v. Avoid giving bath in hospital (never before 24 hours), use moist clean cloth to ensure hygiene.

   Use a wall-mounted room thermometer to ensure that room temperature is maintained at 25°C

7.4 How to keep baby warm?*
   i. Use dry, warm towel to hold the baby at birth. Remove wet towel after cleaning
   ii. Adequate and appropriate clothing
   iii. Promote skin-to-skin contact or keep next to mother (Rooming-in)
   iv. Use radiant warmer in nursery
   v. Keep the room temperature of baby care area >25°C.

7.5 How to keep room warm?
   i. Avoid setting air conditioner temperature less than 25°C. If baby is low birth weight or preterm air conditioner can be avoided
   ii. Don't use ceiling fan especially at high speed
   iii. Keep windows and doors closed in winter
   iv. Warm the room by convector/heater (ensure these devices are away from baby)

*Using a 200 watt bulb may not be sufficient to keep the baby warm. There is also a risk of breakage of bulb
नवजात शिशुओं में ठंडापन (छाइयोथेमिया)

ठंडापन क्या है?
जब शिशु के शरीर का तापमान 36.5 °C से कम हो जाता है, तो ऐसी अवस्था के ठंडापन कहते हैं।
आप तीन मिनट के लिए आंत्र के ऊपर लें और फिर 4 से 5 मिनटों के लिए बच्चे के शरीर के तापमान मापें।

ठंडापन क्यों महत्वपूर्ण है?
1. कम जन्म वाले शिशुओं में ठंडापन नीति का कारण हो सकता है।
2. ठंडापन का जीवाचार शिशु में रोगों को रोकने की कई तरीकों में होता है।
3. ठंडापन एक कम जन्म वाले बच्चे के शरीरिक विकास के काम करता है।

ठंडापन की गंभीरता

<table>
<thead>
<tr>
<th>सामान्य श्रेणी (36.5°C to 37.5°C)</th>
<th>मध्य ठंडापन (36.0°C to 36.4°C)</th>
<th>व्यापक ठंडापन (32.0°C to 35.9°C)</th>
<th>गंभीर ठंडापन (&lt;32°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.5°C</td>
<td>36.4°C-36°C</td>
<td>35.9°C-32°C</td>
<td>&lt;32°C</td>
</tr>
</tbody>
</table>

ठंडापन किसे होता है?
1. जब प्रमुख वस्तु युगल ठंडा होता है।
2. शिशु के बोध बुद्धि मूलभूत नहीं होता है।
3. शिशु को मस्त के दर्द से रखा है।
4. शिशु की परिमाण बढ़ाए रहे नहीं होते।
5. नहाने के दौरान पानी का कमजोर उपयोग नहीं हो।

कौन से बच्चों में ठंडापन होने की संभावना होती है?
1. कम जन्म वाले शिशु
2. बीमार में शिशु
3. जन्म के गुरुत्व जादा

शिशु की उपचार कैसे करें?

1. शिशु को साप्त (warmer) के नीचे अथवा इन्फेंटर में रखें।
2. शिशु को कैपाक माता देखभाल करें।
3. यदि ताप/इन्फेंटर उपवस्तु नहीं है तो तापमान के लिए ऊँचाई बढ़ाए रहें।

<table>
<thead>
<tr>
<th>जन्म भार (किग्रा.)</th>
<th>तापमान</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0-1.5</td>
<td>30-33°C</td>
</tr>
<tr>
<td>1.5-2.0</td>
<td>28-30°C</td>
</tr>
<tr>
<td>2.0-2.5</td>
<td>26-28°C</td>
</tr>
</tbody>
</table>

ठंडापन से प्रभावित शिशु को उपचार कैसे करें?

1. गर्म कपड़े मुश्किलित करें।
2. गर्म-ठंडे कपड़े ड्राय हैं, और गर्म बनाए रखें।
3. तापमान के दौरान शिशु के लिए तापमान की स्थिति और/या बच्चे के रीतियों इन्फेंटर प्रोग्रेस के प्रभाव का अनुमान रखें।
4. स्थान जीवाचार करें।
5. बच्चे के लिए तापमान की जीवाचार करें।
6. यदि तापमान बढ़ जाता है तो संक्रमण नुसा के संगती से रखें।
Module 2: Thermal Protection

Division of Neonatology, Department of Pediatrics, All India Institute of Medical Sciences, New Delhi

How to rewarm a hypothermic baby

1. Keep baby under radiant warmer or inside incubator
2. Provide Kangaroo Mother Care
3. Keep baby warm at home

How to keep a LBW baby warm at home

1. Keep baby under radiant warmer or inside incubator
2. Provide Kangaroo Mother Care
3. Keep baby warm at home

Avoid till baby is 2 kg

Module 2 - Thermal Protection

Low birth weight babies

1. When delivery room is too cold
2. Baby is not mobile immediately after birth
3. Baby is kept away from mother
4. Baby is not mobile immediately after birth
5. Exposure during drying

Why does it occur?

Severe hypothermia (≤3.0°C)

Moderate hypothermia (3.0°C to 3.5°C)

Cold stress (3.5°C to 4.0°C)

Normal range (37.5°C to 38.5°C)

Severity of hypothermia

You can measure temperature of a baby by keeping themomer in the palm of the hand for 3 minutes and then taking note. If the temperature is below 36.5°C, it is defined as a hypothermic baby by keeping it on warmth.
There will be an oral drill by the facilitator on 'ASSESSMENT OF TEMPERATURE AND MANAGEMENT OF HYPOTHERMIA'.

The assessment, clinical features and management of hypothermia are summarized in the following table:

<table>
<thead>
<tr>
<th>Category</th>
<th>Temp. range</th>
<th>Feel by touch</th>
<th>Clinical features</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>36.5 to 37.5°C</td>
<td>Warm abdomen</td>
<td>Normal baby</td>
<td>o Cover adequately with cloth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Warm extremities</td>
<td></td>
<td>o Keep the baby next to mother</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o Encourage breast feeding</td>
</tr>
<tr>
<td>Mild hypothermia (Cold stress)</td>
<td>36 to 36.4°C</td>
<td>Warm abdomen</td>
<td>Extremities bluish and cold</td>
<td>o Skin-to-skin contact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cold extremities</td>
<td>Lethargy</td>
<td>o Cover adequately</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Poor weight gain if chronic cold stress</td>
<td>o Ensure room is warm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o Encourage breast feeding</td>
</tr>
<tr>
<td>Moderate hypothermia</td>
<td>32 to 35.9°C</td>
<td>Cold abdomen</td>
<td>Poor sucking</td>
<td>o Provide warmth-ensure room temperature 25-28°C, use warm linen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cold extremities</td>
<td>Lethargy</td>
<td>, skin to skin care or warmer/bulb</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Weak cry</td>
<td>o Vitamin K (if not given earlier)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fast breathing</td>
<td>o Monitor blood sugar</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o Reassess every 15 minutes till temperature is normal, subsequently</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>every 30 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o Encourage breast feeding</td>
</tr>
<tr>
<td>Severe hypothermia</td>
<td>Less than 32°C</td>
<td>Cold abdomen</td>
<td>Lethargic</td>
<td>o Rapid re-warming till baby</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cold extremities</td>
<td>Poor perfusion/mottling</td>
<td>is 34°C and then slow re-warming</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fast or slow breathing</td>
<td>o Give oxygen to maintain SpO2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Slow heart rate</td>
<td>o IV fluids - Dextrose (monitor blood sugar)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hardening of skin with redness and edema</td>
<td>o Inj-vitamin K</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bleeding</td>
<td>o Reassess every 15 minutes; if temperature doesn’t improve, provide</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>additional heat</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o Once temperature normalizes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>monitor vitals every 30 minutes.</td>
</tr>
</tbody>
</table>

Inform the doctor immediately if temperature is less than 36°C

Remove the wet cloth, place the baby under heat source, encourage breastfeeding. Start oxygen administration if the baby has respiratory distress or cyanosis.

- Avoid use of hot water bottle for (re) warming the baby as this can cause skin burns
- Use warm clothes to cover the baby for providing extra warmth; in places where electricity is not available use a tawa to warm the clothes
- During transportation to another hospital, the baby is kept warm by keeping the baby in direct skin-to-skin contact with the mother or another relative
1. Newborn baby is prone to develop hypothermia due to
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

2. Enumerate four mechanisms of heat loss in neonates:
   i. ___________________________________________________________________
   ii. ___________________________________________________________________
   iii. ___________________________________________________________________
   iv. ___________________________________________________________________

3. Steps of "Warm chain" in hospital include following:
   In labor room                      In postnatal ward
   i. _____________________________    i. ________________________________
   ii. _____________________________    ii. ________________________________
   iii. _____________________________    iii. ________________________________
   iv. _____________________________    iv. ________________________________
   v. _____________________________    v. ________________________________

4. Routine temperature should be recorded by ______________ route.

5. Normal axillary temperature range is___________to_____________

6. How can you assess baby's temperature by touch?
________________________________________________________________________

7. A baby with cold stress will have warm abdomen and _______________ soles/palms.

*You will be given individual feedback after you have evaluated yourself.*
GROUP DISCUSSION - CASE STUDY

You are posted in postnatal ward. A recently delivered mother complains that her baby is lethargic. On examination you find a 6 hr old, 2.2 kg baby lying away from mother. The baby has not been dressed in any clothes and only wrapped in a hospital cotton sheet. Heart rate is 140/minute, RR 56/minute. Extremities are cold to touch and bluish while abdomen is warm to touch. You record axillary temperature which is 36.1°C. The room temperature is 22°C.

Q1. What is the problem with this baby?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Q2. What are the adverse effects of this condition?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Q.3 What led to this situation in the baby?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Q.4 What will you do to rectify those conditions?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Q.5 What type of thermometers are available in your hospital? Do they measure temperature below 35.5°C?
________________________________________________________________________
ROLE PLAY

You will observe the role play being conducted by two facilitators on ‘How to keep baby warm in postnatal ward’. Write your comments for discussion at the end of the role play.

Objective: To demonstrate how to keep a baby warm in postnatal ward.

**Checklist for the demonstration role play**

A (Ask)

____________________________________________________________________________

____________________________________________________________________________

L (Listen)

____________________________________________________________________________

____________________________________________________________________________

P (Praise)

____________________________________________________________________________

____________________________________________________________________________

A (Advise)

____________________________________________________________________________

____________________________________________________________________________

C (Check understanding)

____________________________________________________________________________

____________________________________________________________________________

**Checklist for role play by the participants**

A (Ask)

____________________________________________________________________________

____________________________________________________________________________

L (Listen)

____________________________________________________________________________

____________________________________________________________________________

P (Praise)

____________________________________________________________________________

____________________________________________________________________________

A (Advise)

____________________________________________________________________________

____________________________________________________________________________

C (Check understanding)

____________________________________________________________________________

____________________________________________________________________________
8. KEEPING RADIANT WARMER OR INCUBATOR READY TO RECEIVE A BABY

Prepare a bed at least 20-30 minutes before the baby arrives in the nursery to ensure the baby is received in warm, comfortable environment.

**Keeping radiant warmer ready***

1. Clean the radiant warmer properly before use.
2. Switch on the mains.
3. Put the baby sheet on the bed. Arrange all the necessary items near the bed.
4. Put the radiant warmer on the manual mode with 100% heater output for at least 20 minutes so that the temperature of all items likely to come in contact with baby are warm.
5. Cover the head and feet of the baby, while under radiant warmer.
6. Ensure skin probe is applied to baby in servo with desired setting 36.5°C.

**Keeping incubator ready***

1. Clean the incubator properly before use.
2. Switch on the mains.
3. Put the baby sheet on the bed. Arrange all the necessary items near the bed.
4. Put the incubator ON in air mode with 33°C for at least 30 minutes before.
5. Shift to skin servo mode with temperature set at 36.5°C.
6. Manage via portholes and combine various activities.

* For more details refer to module on equipments

9. HYPERTERMIA/HIGH TEMPERATURE

9.1 What is a high temperature?

High temperature, fever or hypertermia, occurs when the body temperature rises above 37.5°C. It is not as common as hypothermia, but it is equally dangerous. The causes of high temperature may be:

- The room is too hot
- The baby has too many layers of clothes
- The baby has an infection.
- Baby has dehydration due to low intake of breastmilk

9.2 How to prevent high temperature?

- Keep the baby away from sources of heat (warmer, heater, etc.), direct sunlight
- If the baby feels hot, remove a layer of clothing
- If the baby has been under a radiant warmer
  - Measure the baby's body temperature every hour until it is in normal range.
  - Measure the temperature under the radiant warmer every hour and adjust the temperature setting accordingly. If there is no obvious reason to suspect overheating, inform Doctor who will evaluate.
- Ensure the temperature probe is properly secured.
9.3 Steps to be undertaken if the elevated body temperature is due to overheating.

The steps are summarized below:

<table>
<thead>
<tr>
<th>Treatment of hyperthermia due to overheating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Place the baby in a normal temperature environment (preferably 25°C), away from any source of heat.</td>
</tr>
<tr>
<td>2. Undress the baby partially or fully, if necessary.</td>
</tr>
<tr>
<td>3. Give frequent breastfeeds.</td>
</tr>
<tr>
<td>4. Measure the baby’s axillary temperature every hour until it is in the normal range.</td>
</tr>
<tr>
<td>5. If the body temperature is very high (&gt;39°C), sponge the baby with tap water. Examine the infant for infection.</td>
</tr>
</tbody>
</table>

Both hypothermia and hyperthermia can be signs of sepsis. If a baby has been in a stable temperature environment with fairly constant temperature readings, but begins to have fluctuating temperature readings (low, high or both) inform the Doctor for evaluation.

A temperature below 35.5°C is a danger sign. A temperature above 37.5°C not due to excess warming is a danger sign.

Avoid ice cold water or ice for sponging. Use tap warm water.

Recommended reading

- Thermal Protection of the Newborn: A Practical Guide WHO WHO/RHT/MSM/97.2
- Teaching Aids NNF, Publication of National Neonatology Forum of India 2005, 3rd Ed., Deorari AK (Ed)
Module 2: Thermal Protection

Hypothermia

Axillary temperature <36.5°C

- Look for possible cause of hypothermia
- Check room temperature

Hypothermia

Mild hypothermia 36°C – 36.4°C

- Ensure room is warm (maintain at 25°C – 28°C)
- Position baby skin-to-skin with mother
- Continue breast feeding
- Recheck temperature in 1 hour;
  - If temperature is normal, cover the baby adequately including head, hands and feet
  - If no improvement, treat as Moderate

Moderate hypothermia 32°C–35.9°C

- Provide warmth using a warmer (or electric bulb)
- If no warmer is available, start skin to skin with mother (KMC). Cover mother and baby together optimally using pre-warmed clothes
- Ensure room is warm (maintain at 25°C – 28°C)
- Continue breast feeding
- Measure blood glucose, if <45mg/dl, treat for hypoglycemia
- Reassess every 15 minutes; if temperature does not improve, increase setting of warmer - Reassess
- If no improvement or no warmer, REFER

Severe hypothermia <32°C

- Provide warmth using a warmer
- Rapid re-warming till baby is 34°C and then slow re-warming
- Start oxygen to maintain saturation and maintenance fluid
- Give Inj Vitamin K, if not given or status unknown
- Ensure room is warm (maintain at 25°C – 28°C)
- Measure blood glucose, if <45mg/dl, treat for hypoglycemia
- Reassess every 15 minutes, if temperature does not improve increase setting of warmer - Reassess
- If no improvement, REFER

*Hypothermia can be a sign of infection*

* Initially use high setting of the warmer and if the baby's temperature has been increasing at least 0.5°C per hour over the last 3 hours, rewarming is successful, shift to lower setting of warmer and continue measuring the baby's temperature every 2 hours
Hyperthermia

Axillary temperature >37.5°C

Hyperthermia

- Look for possible cause
- Check room temperature (maintain at 25-28°C)
- Look for signs of infection
- Look for signs of dehydration*

- Keep baby away from source of heat (warmer, heater, sunlight)
- Remove extra clothes
- Decrease environmental temperature (if needed)
- Recheck baby's temperature every 1 hour till normal
- If >39°C, sponge the baby with luke warm water
- Treat underlying cause
- Ensure adequate feeding or fluids
- Treat dehydration* by supplementing extra feeds or fluids
- Measure blood glucose; if <45mg, treat for hypoglycemia
- Do not give antipyretic

* Signs of dehydration in a newborn
- Sunken eyes, or
- Depressed fontanelle, or
- Loss of skin elasticity, or
- Dry tongue and mucous membrane

Hyperthermia can be a sign of infection