

Hypothermia in Preterm infants

Slide no 1

Dear friends today we shall learn about hypothermia in preterm infants

Slide 2

In this webinar we shall discuss about the effect of hypothermia on mortality and morbidity rates in preterm infants. We shall also learn about thermal well being in preterm infants.

Slide 3

Hypothermia can have many adverse effects as shown in this slide. The effects include respiratory problems like apneas, aggravation of hypoxia and persistent pulmonary hypertension. Additionally, myocardial dysfunction, shock, metabolic effects like hypoglycemia and acidosis, increase in risk of sepsis, coagulopathy and also neurological injuries.

Slide 4

In a study by Laptook et al. in 2007 on the relation between admission temperature and its effect on mortality and morbidity in very low birth weight infants, each 1 degree centigrade drop in temperature from normal zone increases mortality by 28% and morbidities like infection by 11%.

Slide 5

In this graph x-axis represents admission temperature and y-axis represents the incidence of combined adverse outcomes. This graph depicts that the neonates with admission temperature lying between 36.5 to 37 degree celcius have a lower incidence of mortality and morbidity like severe retinopathy of prematurity, severe brain injury, nosocomial infections, necrotizing enterocolitis, broncho pulmonary dysplasia and requirement of ventilation. The mortality and morbidity rises exponentially in neonates with admission temperatures below 36 degree celcius.

Slide 6

In a report published by UNICEF in 2007, interventions preventing hypothermia can lead to 18-42% reduction in mortality and morbidity. The impact of these interventions looks promising as suggested by the numbers.

Slide 7

Now, we will look at why a preterm newborn is more prone for hypothermia. To understand, we will look at some basic concepts in thermal regulation.

Slide 8

First we shall learn about the concept of thermo neutral zone. In this graph, x-axis represents environmental temperature and y-axis represent the basal metabolic rate of the neonate to maintain normal temperature. You can see here that basal metabolic rate is minimal in the temperature zone between 26-28 degree celcius to maintain normal temperature in the baby. This is called thermo neutral zone for that neonate. This zone of temperature depends on the birth weight, postnatal age, the clothing and degree of sickness in the neonate.

Slide 9

There are 4 mechanisms by which neonate can have heat loss. They are convection, conduction, radiation and evaporation.

Slide 10 and 11

First one is by convection, which involves the heat loss from the body surface of due to air current or air flow. Hence, it becomes important mechanism of heat loss in a very cold room with more air currents

The baby can lose the heat by this method when kept near an open window, in unregulated use of fans and air conditioners and when cold medical gases are used for respiratory support.

Slide 12

Second mechanism is heat loss by conduction occurs from the neonate's body to cooler objects which are in direct contact with the body. Common situations

include using wet linen for covering or cleaning the baby and keeping the baby on directly on the cool surfaces like weighing scale or x-ray cassettes.

Slide 13

The third mechanism of heat loss is radiation in which the neonate loses heat to colder surrounding objects which are not in direct contact with the body. Nursing a neonate near a cold wall, inadequate clothing and keeping too many cold objects in the room shall predispose this neonate for heat loss by this mechanisms.

Slide 14

The fourth and the last mechanism of heat loss is by evaporation and it occurs when water evaporates and gets converted to its gaseous form. So, if you don't dry the neonate fast, then this becomes major source of heat loss. Also prolonged contact with wet linen, bathing and wet nappies or diapers are the common situations in which these neonates are prone for heat loss by this method.

Slide 15

After understanding about the mechanisms of heat loss, we shall now learn about the risk factors and the physiological handicaps in preterm neonates which make the neonate prone for hypothermia.

Slide 16

The lesser brown fat tissue, larger surface area per unit kg of body weight, immaturity of the skin and increased trans epidermal water loss are the main reasons for predisposition to hypothermia in these neonates. Let us know understand each of these risk factors in detail.

Slide 17

In neonates, brown fat is located on the back, along the upper half of the spine and toward the shoulders and axilla and also around kidneys. The brown fat which is the major contributor to non-shivering thermogenesis is very less in the preterm neonate. It is even lesser in the more immature neonates.

Slide 18

The body surface area of a neonate per unit kg wt is 7 times more when compared to that of an adult. These neonates have limited capacity to keep the limbs in flexion which is further more in preterm neonates. This predisposes the neonate to a greater heat loss.

Slide 19

During the neonatal period, the outer most protective layer of the skin is very thin and non-cornified compared to the adult skin. The skin is also less hydrated due to immaturity of its sweat and sebaceous glands. Hence, the neonates loose heat and have higher insensible water losses due to evaporative mechanisms thus leading to hypothermia. The skin usually matures to that of adult by 2-4 weeks of life.

Slide 20

The neonate's skin is more prone to injuries due to adhesives and invasive lines. These injuries again increase the evaporative losses.

Slide 21

The key messages from this webinar include

Hypothermia increases mortality and major morbidities in preterm infants. Ideal environmental temperature for nursing these neonates is based on weight, postnatal age, clothing and degree of sickness. Immature and thinner layers of skin, increased insensible water loss, larger body surface area and lesser brown fat tissue are the main risk factors for having hypothermia in these infants

Thank You