HIGH RISK INFANT
INTRODUCTION

• A newborn, regardless of gestational age or birth weight, who has a greater than average chance of morbidity or mortality because of conditions or circumstances superimposed on the normal course of events associated with birth and the adjustment to extra uterine existence.
FACTORS – TO DEFINE HIGH RISK INFANT

A) Demographic social factors:
   Maternal age <16 or >40, unmarried, physical stress, Socio-economic status

B) Past medical history:
   Diabetes Mellitus, genetic disorders, hypertension

C) Previous pregnancy:
   Intrauterine death, neonatal death, IUGR, IEMs, congenital malformations
FACTORS – TO DEFINE HIGH RISK INFANT

D) Present Pregnancy:
Vaginal bleeding, PROM, multiple gestation, preeclampsia, abnormal USG findings

E) Labor: and delivery:
Obstructed labor, fetal distress, forceps delivery, meconium stained liquor

F) Neonate:
birth weight <2000 or >4000, gestation <37 or >42
SGA, Respiratory distress, congenital malformation
DEFINITIONS

Low Birth Weight Infant:
Live born baby weighing 2500 gram or less at birth.
(VLBW: <1500 gm, ELBW:<1000 gm).

Preterm:
When the infant is born before term. i.e.: before 38 weeks of gestation.

Premature:
When the infant is born before 37 weeks of gestation.
DEFINITIONS

Full term:
When the infant is born between 38 – 42 weeks of gestation.

Post term:
When the infant is born after 42 weeks of gestation.
HYPOTHERMIA
It is a condition characterized by lowering of body temperature than 36°C.

Types of Hypothermia:
Could be classified according to Causes and according to Severity.
CLASSIFICATION BASED ON CAUSE

• Primary Hypothermia:
  – Seen immediately after delivery
  – Normal term infant delivered into a warm environment may drop its rectal temperature by 1 – 2°C shortly after birth and may not achieve a normal stable body temperature until the age of 4 – 8 hours.
  – In low birth weight infants, the decrease of body temperature may be much greater and more rapid unless special precautions are taken immediately after birth. (loss at least 0.25 °C/min.) (careful dryness).
CLASSIFICATION BASED ON CAUSE

• Secondary Hypothermia:
  – This occurs due to factors other than those immediately associated with delivery.
  – Important contributory factors are:
    e.g.: Acute infection especially *Septicemia*. 
CLASSIFICATION BASED ON SEVERITY

II) According to Severity:

(1) Mild Hypothermia: < 36°C
(2) Moderate Hypothermia: < 35.5°C.
(3) Severe Hypothermia: < 35°C.
CLINICAL FEATURES

- Decrease in body temperature measurement
- Cold skin on trunk and extremities
- Poor feeding in the form of poor suckling
- Shallow respiration
- Cyanosis
- Decrease activity, e.g. Weak cry
FOUR MODALITIES OF HEAT LOSS IN NEONATES

1. Evaporation:
Heat loss that resulted from expenditure of internal thermal energy to convert liquid on an exposed surface to gases, e.g.: amniotic fluid, sweat.

Prevention: Carefully dry the infant after delivery or after bathing.

2. Radiation:
It occurred from body surface to relatively distant objects that are cooler than skin temperature.
3. Conduction:
Heat loss occurred from direct contact between body surface and cooler solid object.

Prevention:
Warm all objects before the infant comes into contact with them.

4. Convection:
Heat loss is resulted from exposure of an infant to direct source of air draft.

Prevention:
- Keep infant out of drafts.
- Close one end of heat shield in incubator to reduce velocity of air.
MANAGEMENT

• Infant should be warmed quickly by wrapping in a warm towel.

• Uses extra clothes or blankets to keep the baby warm.

• If the infant is in incubator, increase the incubator’s temperature.

• Avoid exposure to direct source of air drafts.

• Check body temperature frequently.

• Give antibiotic if infection is present.
HYPERTHERMIA
DEFINITION

It is a condition characterized by an elevation in body temperature more than 37.5°C.

Causes:

1. Disturbance in Heat Regulating Center caused by intracranial hemorrhage, or intracranial edema.

2. Incubator temperature is set too high.
MANAGEMENT

• Undress the infant. If at home; keep light cloths, cover that containing light sheet, Or only a diaper if the infant is inside an incubator.

• Reduction of incubator temperature.

• Provide Tepid sponge bath.

• If available; fill the water mattress with tape water, and keep it in contact with the infant’s skin.

• Increase fluid intake in the form of 5cc of Glucose 5% between feeds to prevent dehydration.
HYPOGLYCEMIA
DEFINITION:

Neonatal hypoglycemia is usually defined as a serum glucose value of < 40-45 mg/dl.

For the preterm infant a value of < 30 mg/dl is considered abnormal (hypoglycemia).
NEONATES AT RISK FOR DEVELOPING HYPOGLYCEMIA:

1- The main cause may become maternal malnutrition during pregnancy which leads to fetal malnutrition and of course a low birth weight.

2- Those infants whom are Small for gestational age infants (SGA), that manifested by decrease in their birth weight and subcutaneous fat and hepatic glycogen.

3- Those infants’ of diabetic mothers (IDM) or those named as large for gestational age (LGA).
4- Those whom placentas were abnormal, e.g. placenta Previa.

5- Those whom their mothers had toxemia during pregnancy, e.g. eclampsia or pre-eclampsia, induction of labor preterm infant.

6- Those very ill or stressed neonates whom their metabolic needs were increased due to hypothermia, infection, respiratory distress syndrome, or cardiac failure.
PATHOPHYSIOLOGY

Fetus receives glucose from the mother

Glucose level falls from 70 – 80 mg/dl to 50 mg/dl

Hepatic glucose is released into the blood

Cold extra-uterine one,
Beginning the respiratory cycles,
Muscular activity
Suckling effort

Risk for developing hypoglycemia.

Cord cut

High risk infant
CLINICAL MANIFESTATIONS:

1- Hypotonia
2- Feeding poorly after feeding well
3- Tremors
4- Cyanotic spells
5- Lethargy
6- Seizures
CLINICAL MANIFESTATIONS:

7- Hypothermia.

8- Irregular respiratory pattern (Apnea).

9- Irritability.

10- High pitched cry followed by weak cry.

11- Poor reflexes, especially sucking reflex.
MANAGEMENT OF THE NEONATE AT RISK:

Prevention:

First of all, providing a warm environment.

Early enteral feeding is the single most important preventive measure.

If enteral feeding is to be started, breast or artificial milk should be used if the infant is able to tolerate nipple or nasogastric tube feeding.
These infants should have glucose values monitored until they are taking full feedings and have three normal pre-feeding readings above 40-45 mg/dl.

Care must be taken to ensure that breastfeeding mothers are providing an adequate intake. If the infant at risk for hypoglycemia is unable to tolerate nipple or tube feeding, maintenance IV therapy with 10% glucose should be initiated and glucose levels monitored.
MANAGEMENT OF THE NEONATE WITH HYPOGLYCEMIA:

Infants who develop hypoglycemia should immediately be given 2 cc/kg of 10% dextrose over 5 minutes, repeated as needed.
A continuous infusion of 10% glucose at a rate of 8 mg/kg/min should be started to keep glucose values normal (NOTE: 10 mg/kg/min of 10% dextrose = 144 cc/kg/day). Frequent bedside glucose monitoring is necessary.

When feedings are tolerated and frequent bedside glucose monitoring values are normal, the infusion can be tapered gradually.
INFANT OF DIABETIC MOTHER
INFANT OF DIABETIC MOTHER
INFANT OF DIABETIC MOTHER
PATHOPHYSIOLOGY

Maternal hyperglycemia

→ Fetal hyperglycemia in-utero

→ Fetal hyperinsulinemia - increased fat and glycogen synthesis - Macrosomic infant

→ Interrupts the transplacental glucose supply

→ Inspite of which Hyperinsulinemia persists, this leads to hypoglycemia
DISORDERS IN INFANTS OF DIABETIC MOTHERS

- Hypoglycemia.
- Hypocalcemia.
- Hypomagnesemia.
- Cardio-respiratory disorders
- Hyperbilirubinemia (Unconjugated)
- Birth injuries
- Congenital malformations
MANAGEMENT:

• For the mother:
  Good antenatal care for proper control of maternal diabetes

• For an infant:
  All IDMs should receive continuous observation and intensive care. Serum glucose levels should be checked at birth and at half an hour, 1, 2, 4, 8, 12, 24, 36 and 48 hours of age:
MANAGEMENT:

• If clinically well and normoglycemia; oral or gavage feeding should be started and continued within 2 hours intervals.

• If hypoglycemic; give 2 – 4 ml/kg of 10% dextrose over 5 minutes, repeated as needed.

• A continuous infusion of 10% glucose at a rate of 8-10 mg/kg/min. Start enteral feeding as soon as possible. Give Corticosteroids in persistent hypoglycemia.

• Oxygen therapy for RDS, Calcium gluconate 10% for hypocalcemia, phototherapy for hyperbilirubinemia.
NEONATAL SEPSIS
INTRODUCTION

• The newborn infant is uniquely susceptible to acquire infection, whether bacterial, viral or fungal.

• Bacterial sepsis and meningitis continue to be major causes of morbidity and mortality in the newborn.

• The mortality rate due to sepsis ranges from 20% to as high as 80% among neonates. Surviving infants can have significant neurologic squeal because of CNS involvement.
DEFINITION

Neonatal sepsis is a disease of neonates (who are younger than 1 month) in which they are clinically ill and have a positive blood culture.
RISK FACTORS

• Maternal risk factors:
  - e.g.: Premature rupture of membrane.

• Neonatal risk factors:
  - e.g.: Prematurity (less immunologic ability to resist infection + more liable to penetrate their defensive barriers).
ROUTES OF TRANSMISSION

• Through the maternal blood through placenta as rubella, toxoplasma, and syphilis.
• From the vagina or cervix, as groups B streptococci.
• The newborn may be come contact as it passes through the birth canal as gram negative organisms.
• The newborn may come in contact in its environment after birth (Coagulate positive or negative staphylococci).
• When a susceptible host acquires the pathogenic organism, and the organism proliferates and overcomes the host defense, infection results.
CLASSIFICATION OF NEONATAL SEPSIS

• Early onset Sepsis
• Late onset Sepsis
  ▪ Newborns with early-onset infection present within 24 hours till 72 hours.
  ▪ Early-onset sepsis is associated with acquisition of microorganisms from the mother during pregnancy (transplacental infection), or during labor (an ascending infection from the cervix).
  ▪ Late-onset sepsis occurs beyond the first 72 hours of life (most common after the 3rd day till the 7th day after birth) and is acquired from the care giving environment (Nosocomial infection).
CLINICAL FEATURES

• Decreased activity
• Excessive crying
• Apnea
• Jaundice
• Hypothermia
• Bulging or full fontanel
• Seizures
• Hypotonia
LAB FINDINGS

- Raised Total leukocyte count (WBC count)
- Raised C – reactive Protein (CRP)
- Increased Erythrocyte Sedimentation Rate (ESR)
- Cultures positive
MANAGEMENT

- Prevention: through proper application to infection control practices.
- Early onset sepsis; give intrapartum antimicrobial prophylaxis (IAP) to the mother.
MANAGEMENT (CONT..)

• Neonates with clinically suspected sepsis:
  – Culture should be obtained first.
  – The recommended antibiotics are ampicillin and gentamicin.
  – Third generation cephalosporins (Cefotaxime) may replace gentamicin if meningitis is clinically suspected.

• Late onset neonatal sepsis:
  – Vancomycin in combination with either gentamicin or cephalosporins should be considered in penicillin resistant cases.
PREVENTION

• Demonstrate the effect of hand washing upon the prevention of the nosocomial infections.

• Standard precautions should be applied in the nursery for infection prevention.

• Instillation of antibiotics into newborn’s eye 1-2 hours after birth is done to prevent the infection.

• Skin care should be done using worm water & may use mild soup for removal of blood or meconium & avoid the removal of vernix caseosa.

• Cord care should be cared out regularly using alcohol or an antimicrobial agent.
CURATIVE

• Encourage breast feeding from the mother.

• Adequate fluid and caloric intake should be administered by gavage feeding or intravenous fluid as ordered.

• Extra-measure for hypothermia or hyperthermia that may take place to the newborn.

• Administering medications as doctor order.

• Follow the isolation precautions.

• Monitoring intravenous infusion rate and antibiotics are the nurse responsibility.
CURATIVE

• Administer the medication in the prescribed dose, route, and time within hour after it is prepared to avoid the loss of drug stability.

• Care must be taken in suctioning secretions from the newborn as it may be infected.

• Isolation procedures are implemented according to the isolation protocols of the hospital.

• Observe for the complication e.g. meningitis and septic shock.

• Encourage in-service programs and continuing education of nurses regarding the infection control precautions.
HYPERBILIRUBINEMIA
DEFINITION

• Hyperbilirubinemia is an elevation in the neonatal serum bilirubin $\geq 12.9 \text{ mg/dl}$ in Full-term, Formula feed infant OR $\geq 15 \text{ mg/dl}$ in Preterm, Breast feed infant

• Characterized by JAUNDICE, which is defined as “yellowish discoloration of skin and mucous membranes”.

• In the neonate clinical jaundice is diagnosed if the total serum bilirubin is $\geq 7 \text{ mg/dl}$. 
Pathophysiology: = Neonatal Bile Pigment Metabolism.

Destruction of RBCs

- Hemoglobin
  - Water
    - Heme
    - Globin (protein portion reused by the body).
      + O2
      → Biliverdin
  - Salts

IAP Teaching Slides 2015-2016
More $O^2$

$\downarrow$

Unconjugated Bilirubin

$+$

Plasma protein

$\downarrow$

Liver: Which released from plasma protein inside the liver and connected with *Glucuronic acid* and *Glucuronyl Transferease Enzyme* (in the presence of normal Ph, O2, and normal body temperature) to become *Conjugated Bilirubin*, that has 3

**pathways:**

- Bile duct
  - To digest fat
    - Urobilin → Urobilinogen to obtain normal color of urine.

- Kidney
  - Stercobilin → Stercobilinogen to obtain normal color of stool.

- Gastrointestinal tract
Fluorescent light

Baby with mild jaundice
CAUSES

The following are possible causes of hyperbilirubinemia in the newly born infants:

1. Over production of bilirubin.
2. Under excretion of bilirubin.
3. Combined over production and under excretion.
4. Physiological jaundice.
COMPLICATION:

The most common complication of hyperbilirubinemia is Kernicterus (Bilirubin Encephalopathy), which usually occurs when the unconjugated serum bilirubin level exceeds than 20 mg/dl. In small, sick preterm infants, even a bilirubin level in a low range may cause Kernicterus.
Clinical Presentation:

Kernicterus progresses through 4 stages:

Stage I: Poor Moro reflex, poor feeding, vomiting, high-pitched cry, decreased tone and lethargy.

Stage II: Spasticity, seizures, fever. Neonatal mortality is high at this stage (80%).

Stage III: A symptomatic (Spasticity decreases and all remaining clinical signs and symptoms may disappear).

Stage IV: Appears after the neonatal period. Long-term sequelae can include: spasticity quadriplegia, deafness and mental retardation (for the 20%).
PHOTOTHERAPY:

1. Cover the infant’s eyes and genital organs.
2. The infant must be turned frequently to expose all body surface areas to the light.
3. Serum bilirubin level /4 – 12 hours.
4. Each shift, eyes are checked for evidence of discharge or excessive pressure on the lids and eye care should be done using warm water, then apply eye drops or ointment.
PHOTOTHERAPY:

5. Eye cover should be removed during feeding, and this opportunity is taken to provide visual and sensory stimuli.

6. Avoid oily lubricants or lotion on the infant’s exposed skin, because this can act as a barrier that prevent penetration of light through the skin.

7. Increase feeds in volume and calories. Add 20% additional fluid volume to compensate for insensible and intestinal water loss.

8. Intake and output chart.
NEONATAL RESPIRATORY DISORDERS
MANAGEMENT OF RDS:

A) General:
* Basic support including thermal regulation and parenteral nutrition and medications (antibiotics).
  * Oxygen administration, preferably heated and humidified

B) Specific:
Surfactant replacement therapy through ET tube.
TRANSIENT TACHYPNEA OF THE NEWBORN (TTN)

• TTN is a benign disease of near-term or term infants who display respiratory distress shortly after delivery.

• It occurs when the infant fails to clear the airway of lung fluid or mucus or has excess fluid in the lungs, this limit the amount of alveolar surface available for gas exchange, leading to respiratory rate and depth to better use of the surface available.
CLINICAL FEATURES

• The infant is usually near-term or term. Exhibits tachypnea (> 80 breaths/min) shortly after delivery.

• The infant may also display mild grunting, nasal flaring, intercostal retraction, and cyanosis.

• Spontaneous improvement of the neonate, which considered as the most important marker of TTN.
MANAGEMENT

• Oxygenation.

• Fluid restriction.

• Start feeding as tachypnea improves.

• Outcome and prognosis:
  – Peaks intensity reached at 36 hours of infant’s life.
  – The disease is self-limited (respiratory symptoms improve as intrapulmonary fluid is naturally absorbed or artificially mobilized using diuresis).
MECONIUM ASPIRATION SYNDROME (MAS).

• This respiratory disorder is caused by meconium aspiration by the fetus in utero or by the newborn during labor and delivery.

• MAS is often a sign that the neonate has suffered asphyxia before or during birth. The mortality rate can be as high as 50% and survivors may suffer long-term sequelae related to neurological damage.
CAUSES AND PATHOPHYSIOLOGY:

• Fetal hypoxia; e.g. cord prolapse that comes around the neck of the fetus many days before delivery.

• Babies born breech presentation.
  In both cases; intrauterine hypoxia Or breech presentation → vagal nerve stimulation → relaxation of the sphincter muscle → releasing of the first stool (meconium) in the intrauterine life and becomes mixed with the amniotic fluid, with the first breath the baby can inhale meconium.
MANGEMENT

• Suctioning of the oropharynx by obstetricians before delivery of the shoulders.

• Immediate insertion of an ET tube and tracheal suctioning before ambu bagging (Maintain a neutral thermal environment).

Gastric lavage, and emptying of the stomach contents to avoid further aspiration
MANAGEMENT

• Postural drainage and chest vibration followed by frequent suctioning.

• Pulmonary toilet to remove residual meconium if intubated.

• Antibiotic coverage (Ampicillin & Gentamicin).
  Oxygenation (maintain a high saturation > 95%)

• Mechanical ventilation to avoid hypercapnia & respiratory acidosis
APNEA
DEFINITION AND CLASSIFICATION

- Apnea is the cessation of respiration accompanied by bradycardia and/or cyanosis for more than 20 seconds.

- Types
  - Pathological apnea:
    Apnea within 24 hours of delivery is usually pathological in origin.
  - Physiological apnea:
    Apnea developing after the first three days of life and not associated with other pathologies, may be classified as apnea of prematurity.
MANAGEMENT

• Monitor at-risk neonates of less than 32 weeks of gestation

• Begin with tactile stimulation; gentle shaking or prick the sole of the foot often stimulate the infant to breath again

• If no response to tactile stimulation, bag and mask ventilation should be used during the spell.

• CPAP or ventilatory support in recurrent and prolonged apnea

• Pharmacological therapy: Theophylline.
  Treat the cause, if identified, e.g., Sepsis, Hypoglycemia, Anemia
FOLLOW UP OF HIGH RISK INFANT
PRE DISCHARGE

• Active surveillance
  – Medical examination
  – Neurobehavioral and Neurological examination
  – Neuroimaging
  – ROP screening
  – Hearing screening
  – Screening for congenital hypothyroidism
  – Screening for metabolic disorders
CATEGORIZE- FOR FOLLOW UP

• High Risk:
  – Babies with <1000g birth weight and/or gestation <28 weeks
  – Major morbidities such as chronic lung disease, intraventricular hemorrhage and periventricular leucomalacia
  – Perinatal asphyxia - Apgar score 3 or less at 5 min and/or hypoxic ischemic encephalopathy
  – Surgical conditions like Diaphragmatic hernia, Tracheoesophageal fistula 5. Small for date (<3rd centile) and large for date (>97th centile)
  – Mechanical ventilation for more than 24 hours
CATEGORIZE - FOR FOLLOW UP

- Persistent prolonged hypoglycemia and hypocalcemia
- Seizures, meningitis
- Shock requiring inotopic/vasopressor support
- Infants born to HIV-positive mothers
- Twin to twin transfusion
- Neonatal bilirubin encephalopathy
- Inborn errors of metabolism / other genetic disorders
- Abnormal neurological examination at discharge
MODERATE RISK:

– Babies with weight – 1000 g- 1500g or gestation < 33 weeks
– Twins/triplets
– Moderate Neonatal HIE
– Hypoglycemia, Blood sugar<25 m/dl
– Neonatal sepsis
– Hyperbilirubinemia > 20mg/dL or requirement of exchange transfusion
– IVH grade 2
– Suboptimal home environment
• MILD RISK

– Preterm,
– Weight 1500 g - 2500g
– HIE grade I
– Transient hypoglycemia
– Suspect sepsis
– Neonatal jaundice needing PT
– IVH grade 1
FOLLOW UP

Low risk:
Follow up with pediatrician / primary care provider with objective to screen for deviation in growth and development.

Moderate risk:
Follow up with neonatologist and developmental pediatrician:
screen for developmental delay, manage intercurrent illnesses with

- Developmental pediatrician,
- Radiologist, Audiologist, Ophthalmologist
- Social worker, Dietician, Physiotherapist
FOLLOW UP

High risk babies

Neurodevelopmental delay: supervise & screen for developmental delay with Neonatologist and with Team as for Moderate risk and

- Pediatric neurologist
- Geneticist
- Occupational therapist
- Speech therapist
- Endocrinologist
- Pediatric surgeon
THANK YOU