Prematurity (preterm Birth); Causes and Complications

A **premature (preterm) infant** is defined as a baby born **before 37 completed weeks of gestation**. Preterm birth is a major contributor to **neonatal morbidity and mortality**, especially in **low-resource settings**.

Classification of Infants by Gestational Age

Term	Definition
Preterm	<37 weeks of gestation
Term	37–41 weeks of gestation
Post-term	?42 weeks of gestation

Classification by Birth Weight

Category	Birth Weight
Low Birth Weight (LBW)	<2500 g
Very Low Birth Weight (VLBW)	<1500 g
Extremely Low Birth Weight (ELBW)	<1000 g

Etiology and Risk Factors of Preterm Birth

Although many cases occur **idiopathically**, several **maternal, fetal, placental**, and **social** factors contribute.

Maternal Factors

- History of prior preterm birth
- Extremes of maternal age (<17 or >35 years)
- Pre-eclampsia/Eclampsia
- Uterine abnormalities (e.g., bicornuate uterus)
- Cervical insufficiency
- Low pre-pregnancy weight
- Infertility or Assisted Reproductive Technologies (e.g., IVF)
- Recurrent miscarriage or termination

Fetal Factors

- **Multiple gestations**
- Polyhydramnios
- Fetal anomalies or demise

- First-trimester threatened abortion

Placental and Membrane Factors

- **Placenta previa**
- **Abruptio placentae**
- **Chorioamnionitis**
- **Preterm premature rupture of membranes (PPROM)**

Social & Environmental Factors

- Low socioeconomic status
- Smoking, alcohol, or illicit drug use
- Psychological stress
- Physically demanding work

Complications of Prematurity

Complications are divided into **short-term** (neonatal period) and **long-term** (childhood and beyond).

Short-Term Complications

1. Respiratory System

- **Respiratory Distress Syndrome (RDS)** : Due to surfactant deficiency.
  - *Treatment* : Antenatal corticosteroids (e.g., dexamethasone), oxygen therapy, NCPAP, surfactant replacement, mechanical ventilation if severe.
- **Apnea of Prematurity** : Immature brainstem respiratory control.
  - *Definition* : Cessation >20 seconds or <20 seconds with bradycardia/desaturation.
  - *Treatment* : Methylxanthines (e.g., caffeine), NCPAP, mechanical ventilation if severe.

2. Cardiovascular System

- **Patent Ductus Arteriosus (PDA)**
  - *Pathophysiology* : Left-to-right shunt ? pulmonary overcirculation, decreased systemic perfusion.
  - *Diagnosis* : Echocardiography.
  - *Management* : Indomethacin or ibuprofen; surgical ligation if refractory.

3. Central Nervous System

- **Intraventricular Hemorrhage (IVH)**
  - *Source* : Germinal matrix capillaries.
  - *Diagnosis* : Cranial ultrasound.
  - *Complications* : Grades III/IV associated with hydrocephalus, cerebral palsy.
- **Periventricular Leukomalacia (PVL)**

- *Ischemic injury* to periventricular white matter.
- *Outcome* : Often leads to spastic cerebral palsy.

4. Metabolic and Hepatic

- **Hypoglycemia** : Due to low glycogen stores and high metabolic demand.
- **Hyperglycemia** : Due to insulin resistance in VLBW infants.
- **Hyperbilirubinemia** : From hepatic immaturity and increased RBC turnover.
  - *Risk* : Kernicterus at lower bilirubin levels than term infants.

5. Renal

- **Immature kidneys** :
  - *Problems* : Electrolyte imbalances (hypernatremia, hyponatremia, hyperkalemia), metabolic acidosis.
  - *Causes* : Poor urine concentrating ability and insensible losses.

6. Gastrointestinal

- **Necrotizing Enterocolitis (NEC)**
  - *Presentation* : Abdominal distension, bloody stools, apnea, feeding intolerance.
  - *Diagnosis* : Pneumatosis intestinalis on abdominal X-ray.
  - *Treatment* : NPO (nil per os), broad-spectrum antibiotics, surgery if perforation.
  - *Prevention* : Breastfeeding, probiotics.
- **Feeding Difficulties**
  - Due to uncoordinated suck/swallow reflexes and immature GI motility.
  - *Management* : Enteral tube feeding (expressed breast milk preferred), parenteral nutrition initially.

7. Hematologic

- **Anemia of Prematurity**
  - Multifactorial: Reduced erythropoiesis, rapid growth, frequent phlebotomy.
  - *Management* : RBC transfusions, iron supplementation.

8. Immune System

- **Infection Risk**
  - Causes: Underdeveloped immune system, low IgG (from lack of transplacental transfer), frequent invasive procedures.
  - *Common infections* : Sepsis, pneumonia, meningitis.

High-Yield Notes

- **Antenatal corticosteroids** (betamethasone or dexamethasone) are the **standard of care** before expected preterm delivery (<34 weeks) to promote lung maturity.
- **IVH** is most common within the **first 48 hours** of life in preterms.
- **Breast milk** is protective against NEC.
- **Caffeine citrate** is first-line for apnea of prematurity.

- Premature infants often require **thermoregulation, infection control, respiratory support** , and **nutritional supplementation** in a **NICU** setting.