



High-Risk Newborns

Prof.Dr. Norhan Zeki Shaker
Infant ,Child, and Adolescents
Health Care.

3rd Grad
4th week
20/2 /2024



- **Content**
- Definition high risk newborn
- Risk factors of high risk newborn
- Classification of High-Risk Newborn
- Classification according to Birth Weight
- Classification of High-Risk according to Size
- Classification according to gestational age
 - Preterm Infants
 - Post term infants
- Classification according to physiologic maturity





Objectives

In the end of this lecture student will be able to:

- Classify high risk newborns
- Distinct the physical characteristics of High Risk infants.
- Modify a general care plan to meet the needs of an infant with specific high-risk health needs.



High-Risk Newborns

The *high-risk neonate* can be defined as a newborn, regardless of gestational age, size or birth weight, who has a greater-than-average chance of morbidity or mortality, especially within the first 28 days of life.

Risk factors include:

1)Preconception, 2)prenatal, 3)natal, or
4) postnatal conditions or circumstances that
interfere with the normal birth process or delay
adjustment to extra-uterine growth and
development.





Classification of High-Risk Newborn

- Birth Weight; and size
- Gestational Age – preterm/post term ;
- Physiologic Factors associated with state of maturity (hyperbilirubinemia) ;
- Consequences of immature organ systems (hypothermia, Respiratory Distress Syndrome).
- Chemical disturbances (hypoglycemia, hypocalcemia);

Classification according to Birth Weight

1. Low Birth Weight – less than 2500g regardless of gestational age
2. Moderately Low Birth Weight – birth weight is between >1500 to < 2500 g.
3. Very Low Birth Weight – birth weight is less than 1500g.
4. Extremely Low Birth Weight – birth weight less than 1000g.



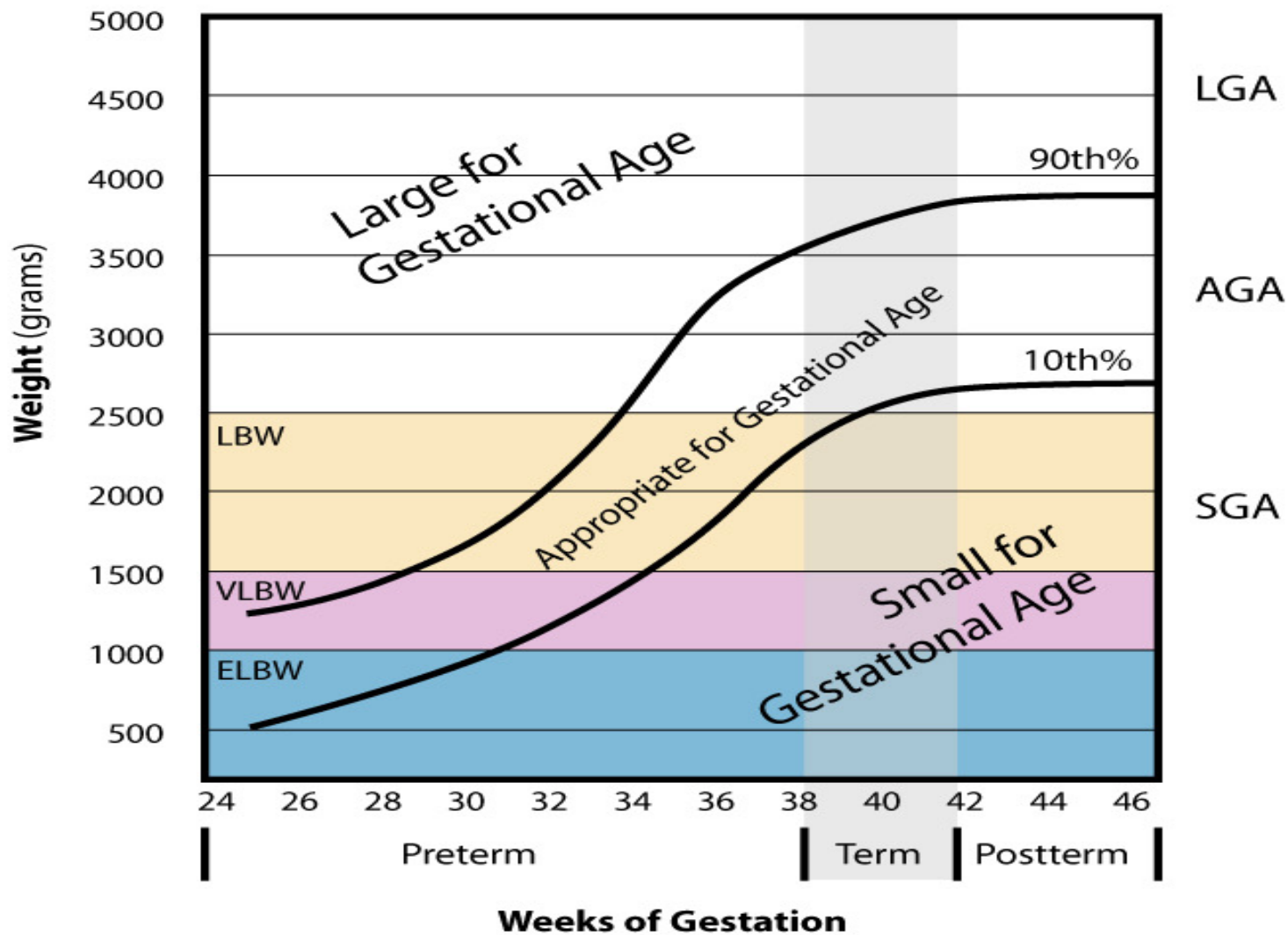
- **Classification of High-Risk according to Size**



Appropriate-for-gestational-age (AGA) infant

An infant whose weight falls between the 10th and 90th percentiles on intrauterine growth curves.





Growth Curves



Small-for-date (SFD) or small-for-gestational-age (SGA) Infant

An infant whose rate of intrauterine growth was slowed and whose birth weight falls below the 10th percentile on intrauterine growth chart.

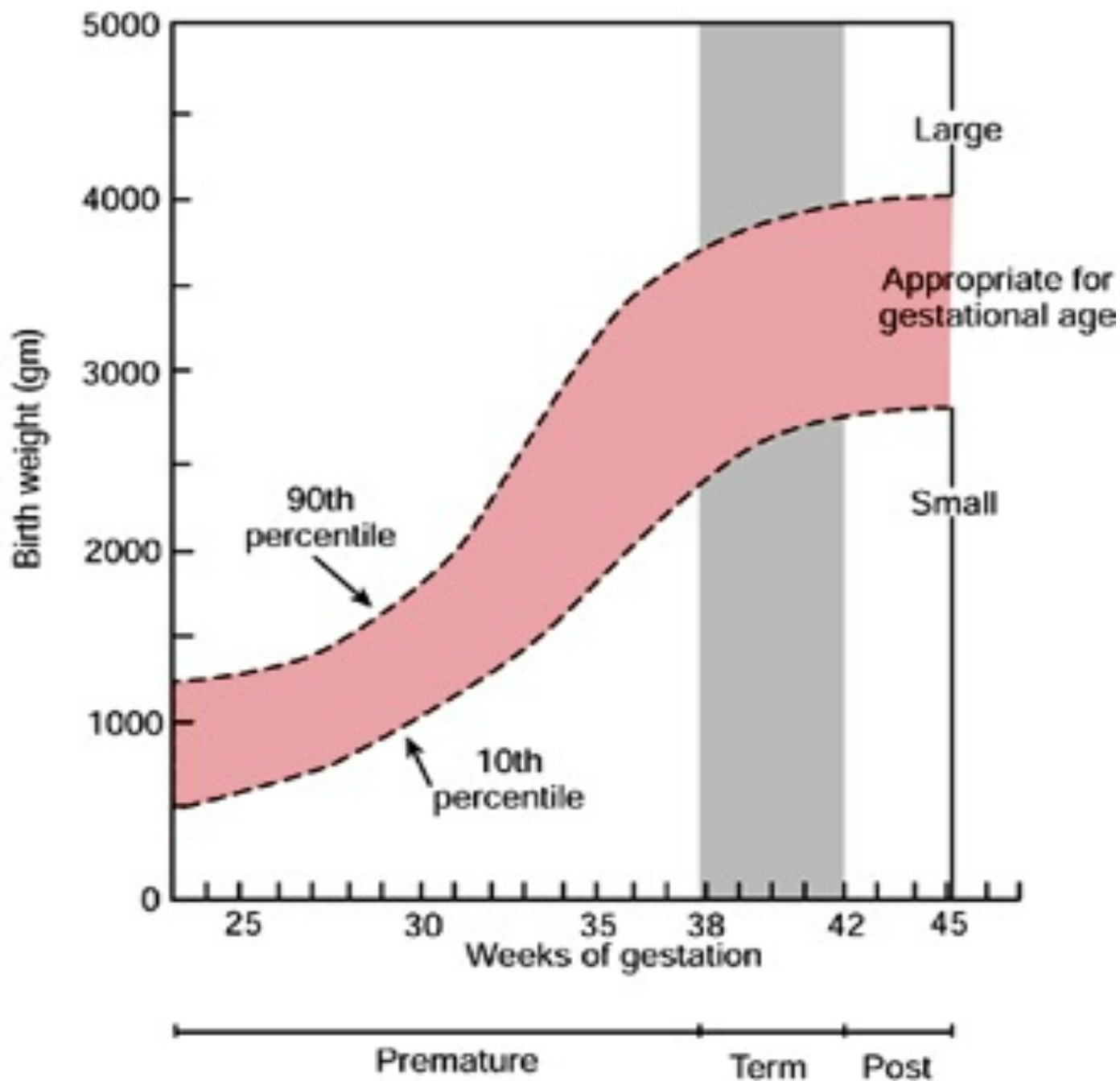
??



Large-for-gestational-age (LGA) infant

An infant whose birth weight falls above the 90th percentile on intrauterine growth Charts.







Classification according to gestational age

Premature (preterm) infant

- An infant born before completion of 37 weeks of gestation, regardless of birth weight.

•Full-term infant

An infant born between the beginning of the 38 weeks and the completion of the 42 weeks of gestation, regardless of birth weight.

•Postmature (postterm) infant

An infant born after 42 weeks of gestational age, regardless of birth weight



- **High Risk Related To Dysmaturity**

- **Preterm Infants**

- Prematurity accounts for the largest number of admissions to an NICU.
- Immaturity of most organ systems places infants at risk for a variety of neonatal complications (e.g., hyperbilirubinemia, respiratory distress syndrome).

The incidence of prematurity is highest among:-

- low socio economic class
- Multiple pregnancies
- Placental problems

Etiology of Preterm Birth



1- Unknown

2- Maternal factor

A/ Socioeconomic

- Malnutrition
- Age
- Race

B/Chronic medical conditions

- Heart disease
- Renal disease
- Diabetes
 - Hypertension

C/ Behavioral

- Substance abuse
 - Smoking
 - Poor or absent prenatal care



Etiology of Preterm Birth

3- Factors Related to Pregnancy

- Multiple pregnancy
- Low body mass index (<19.8 kg/m²)
- Abruptio placentae or placenta previa
- Incompetent cervix
- Premature rupture of membranes or chorioamnionitis
- Polyhydramnios or oligohydramnios
- Infection
- Trauma

4- Fetal Factors

- Chromosomal abnormalities
- Congenital anomalies
- Erythroblastosis (hemolytic disease of the newborn)



• **Diagnostic Evaluation**

Preterm infants characteristics on inspection:-

- **1-**preterm infants are very small and appear scrawny, because they lack or have only minimal subcutaneous fat deposits .
- **2-** Head have a proportionately large head in relation to the body, which reflects the cephalocaudal direction of growth.
- **3-** The skin is bright pink ,smooth, and shiny with small blood vessels clearly visible underneath the thin epidermis.

4-The fine lanugo hair is abundant over the body and fizzy on the head.

5-The ear cartilage is soft and pliable.

6- The soles and palms have minimal creases.

7- The bones of the skull and the ribs feel soft,

8- The eyes may be closed.





9- Male infants have few scrotal rugae, and the testes are undescended; the labia and clitoris are prominent in females.

10- preterm infants may be inactive and listless.

11- Reflex activity is only partially developed
sucking is absent, or weak, or ineffective
swallow, gag, and cough reflexes are absent or weak.

- **NURSING CARE:**
- Maintain airway; check respirator function ,suction when necessary; administer oxygen only if necessary
- Observe for changes in respirations, color, and vital signs
- Maintain temperature of environment;
- Check efficacy of Isolette: maintain heat, humidity, and oxygen concentration;
- Maintain aseptic technique to prevent infection
- Adhere to the techniques of gavages feeding for safety of the infant





Post mature Infants

- Infants born of a gestation that extends beyond 42 weeks as calculated from the mother's last menstrual period (or by gestational age assessment) are considered to be post-mature', or post-term, regardless of birth weight.
- This constitutes 3.5% to 15% of all pregnancies.



- **The cause of delayed birth is:**
 - unknown.
 - History
-
- Some infants are appropriate for gestational age but show the characteristics of progressive placental dysfunction. These infants, often called post mature .



Characteristics of post mature baby

- absence of lanugo;
- little if any vernix caseosa;
- abundant scalp hair;
- long finger nails.
- wasted physical appearance that reflects intrauterine deprivation حرمان.
- Depletion of subcutaneous fat gives them a thin, elongated appearance.
- The little vernix caseosa that remains in the skin folds may be stained a deep yellow or green (Meconium Staining), which is usually an indication of meconium in the amniotic fluid.



- Post term infants are prone for neonatal mortality compared with those born at term.
- They are especially prone to **fetal distress** associated with the decreasing **efficiency of the placenta, macrosomia, and meconium aspiration syndrome.**



MANAGEMENT:

- Check respiratory problems related to meconium Aspiration
- Blood test for hypoglycemia
- Cesarean section usually recommended

- Physiologic Factors associated with state of maturity(hyperbilirubinemia)

Hyperbilirubinemia

Jaundice





High Risk Related To Physiologic Factor

Hyperbilirubinemia

- The term hyperbilirubinemia refers to excessive accumulation of bilirubin in blood and is characterized by jaundice or icterus, yellow discoloration of skin, sclera, and nails .

Pathophysiology



RBC (destroyed)



Hemoglobin



Heme



globin (protein)

un-conjugated bilirubin insoluble, bound to albumin



In the **liver** detached from albumin in presence of the enzyme and converted to *conjugated bilirubin*

Excreted in the bile



In the **intestine**, bacterial action reduces the conjugated bilirubin to urobilinogen, and excreted in feces. (Yellow pigment)

cont .pathophysiology



- Hyperbilirubinemia may result from increased unconjugated or conjugated bilirubin.
- The unconjugated form or indirect hyperbilirubinemia is the type most commonly seen in newborns.

cont .pathophysiology



- Normally, the body is able to maintain a balance between the destruction of RBCs and the use or excretion of byproducts.

cont .pathophysiology



- However, when developmental limitations or a pathologic process interferes with this balance, bilirubin accumulates in the tissues to produce jaundice.



cont .pathophysiology

- On average, newborns produce twice as much bilirubin as do adults because of higher concentrations of circulating erythrocytes and a shorter life span of RBCs (only 70 to 90 days in contrast to 120 days in older children and adults).

Causes of hyperbilirubinemia in the newborn are:



- 1- Physiologic (developmental) factors (prematurity)
- 2- An association with breast-feeding or breast milk
- 3- excess production of bilirubin (e.g., hemolytic disease).
- 4- Disturbed capacity of the liver to secrete conjugated bilirubin (e.g., enzyme deficiency, bile duct obstruction)

continue 



Continued Causes of hyperbilirubinemia

- 5- Combined overproduction and under secretion (e.g., sepsis).
- 6- Some disease states (e.g., hypothyroidism, galactosemia, infant of a diabetic mother)
- 7-Genetic predisposition to increased production (Native Americans, Asians).



- The most common case of hyperbilirubinemia is the relatively mild and self-limited **physiologic jaundice**, or **icterus neonatorum**. Unlike hemolytic disease of the newborn (HDN) .



Feeding :

- (1) stimulates peristalsis and produces more rapid passage of meconium, thus diminishing the amount of re-absorption of unconjugated bilirubin, and
- (2) introduces bacteria to aid in the reduction of bilirubin to urobilinogen.

Colostrum, a natural cathartic, facilitates meconium evacuation.

- **Breast-feeding** is associated with an increased incidence of jaundice.
- Two types have been identified:-
- **1- Early Breastfeeding associated Jaundice** ,begins at **2-to 4 days** of age and occurs in approximately 10 % to 25% of breastfed newborns.
- **2-Late Breastfeeding associated Jaundice** begins at age **5 to 7** days and occurs in 2% to 3% of breast-fed infants. Rising levels of bilirubin peak during the second week and gradually diminish.



- **Breast-feeding associated** jaundice.
- Despite high levels of bilirubin that may persist for 3 to 12 weeks, these infants are well.
- The jaundice may be caused by factors in the breast milk (fatty acids) that either inhibit the conjugation or decrease the excretion of bilirubin.
- **Less** frequent stooling by breast-fed infants may allow for extended time for reabsorption of bilirubin from stools.



Diagnostic evaluation

- The degree of jaundice is determined by serum bilirubin measurements.
- Normal values of unconjugated bilirubin are 0.2 to 1.4 mg/dl.
- In newborns, levels must exceed 5 mg/dl before jaundice (icterus) is observable.



Cont. Diagnostic evaluation

The evaluation of jaundice is not based exclusively on serum bilirubin levels but also on:

- a. Timing of the appearance of clinical jaundice;
- b. Gestational age at birth;
- c. Age in days since birth;
- d. Family history,
- e. Maternal Rh factor;
- f. Evidence of hemolysis;
- g. Feeding method;
- h. Infant's physiologic status;
- i. and the progression of serial serum bilirubin levels.

Assessment of Jaundice



- Newborn jaundice begins in the head and progresses downward.
- How far the jaundice progresses is an indicator of how high the bilirubin levels in the blood are.



Assessment of Jaundice

- The blanch test assists in differentiating cutaneous jaundice from skin color.
- The test is performed by applying pressure with the thumb over a bony area for several seconds.
- If jaundice is present, the blanched area will look yellow before the color returns.

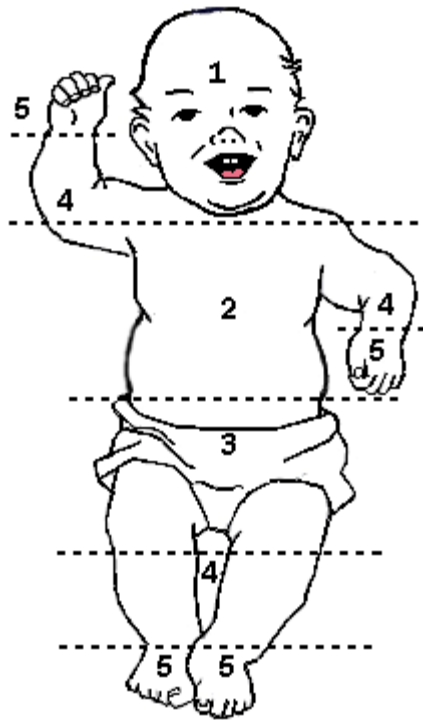


Assessment of Jaundice

- It is better to assess for jaundice in daylight because artificial lighting can distort colors.
- On dark-skinned babies the inner cheek or lip, whites of the eye, tongue, gums and the palms and soles of the feet are checked.

Visually assess the severity of jaundice

Figure 1. Kramer's Rule



Zone	Definition	TSB (micromol/L)
1	Head and neck	100
2	Upper trunk	150
3	Lower trunk and thighs	200
4	Arms and lower legs	250
5	Palms and soles	>250

Approximate level of hyperbilirubinemia by cephalocaudal distribution:

- Nose: 3 mg/100 mL
 - Face: 5 mg/100 mL
 - Chest: 7 mg/100 mL
 - Abdomen: 10 mg/100 mL
 - Legs: 12 mg/100 mL
 - Palms and soles 20 mg/100 mL
-
- An Icterometer is a clear plastic gauge that can also be used to assess bilirubin levels.





Criteria of pathologic jaundice

- ✓ Appearance of jaundice within 24 hours of birth.
- ✓ Persistent jaundice over 2 weeks in a full-term formula-fed infant.
- ✓ Total serum bilirubin levels over 12.9 mg/dl (term infant) or over 15 mg/dl (preterm infant);
- ✓ the upper limit for breastfed infant is 15 mg/dl.
- ✓ Increase in serum bilirubin by 5 mg/dl/day
- ✓ Direct bilirubin exceeding 1.5 to 2 mg/dl



Complication of hyperbilirubinemia

- High bilirubin is causing cell damage for fat tissue as that in the brain lead to kernicterus (encephalopathy) it is more known in extremely high levels and in preterm and sick babies , not common in late onset jaundice as Breast milk jaundice



The signs of bilirubin encephalopathy are :

- 1- Decreased activity, lethargy, irritability,
- 2- Hypotonia and seizures.
- 3- Those who survive may eventually show evidence of neurologic damage (*mental retardation, attention deficit hyperactivity disorder, behavior disorders, perceptual problems, cerebral palsy, and deafness*)



Therapeutic Management

The primary goals in the treatment of hyperbilirubinemia are to prevent bilirubin encephalopathy and, as in any blood group incompatibility, to reverse the hemolytic process .

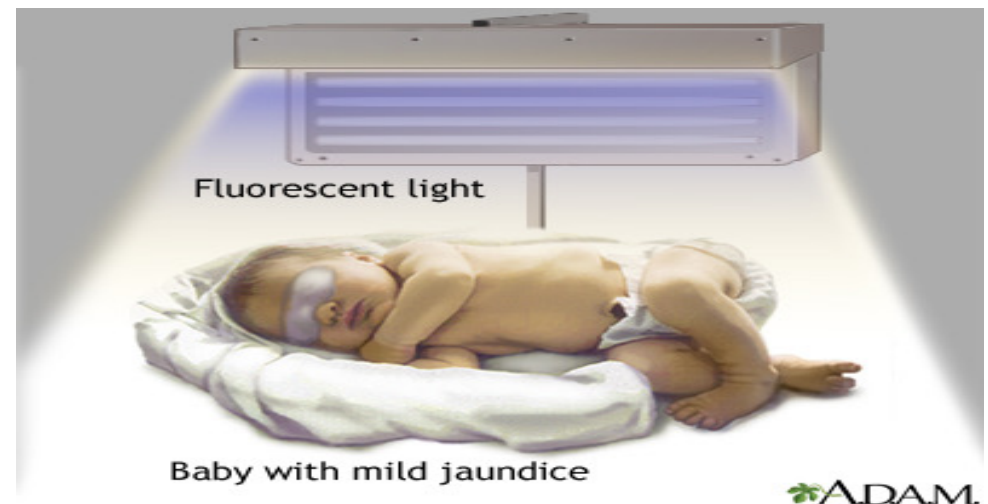


The treatment involves :-

1- Early initiation and frequent breast feeding. These preventive measures are aimed at promoting increased intestinal motility, decreasing enterohepatic shunting, and establishing normal bacterial flora in the bowel to effectively enhance the excretion of unconjugated bilirubin.

2-The use of phototherapy,

Phototherapy consists of the application of a special source of light (irradiance) to the infant's exposed skin .Light promotes bilirubin excretion by **photoisomerization**, which alters the structure of bilirubin to a soluble form (**lumirubin**) for easier excretion.



2-Cont. The use of phototherapy,

The normal light of fluorescent bulbs in the spectrum of 420 to 460 nm is often preferred so the infant's skin can be better observed for color (jaundice, pallor, cyanosis) or other conditions.





2-CONT. The use of phototherapy,

- Increasing irradiance to the 430 to 490 nm band provides best results.
- For phototherapy to be effective, the infant's skin must be fully exposed to an adequate amount of the light source.



2-CONT. The use of phototherapy,

- Intensive phototherapy with a higher irradiance is considered to be more effective than standard photo-therapy for rapid reduction of serum bilirubin levels .
- Best results occur within the first 4 to 6 hours of treatment.



2-CONT. The use of phototherapy,

The recommendations for starting phototherapy in infants:

- a) Weighing less than 1500 g is 5 to 8 mg/dl,
- b) Weighing 1500 to 1999 g 8 to 12 mg/dl
- c) Weighing 2000 to 2499 g 11 to 14 mg/dl.



3- Exchange transfusion is generally used for reducing dangerously high bilirubin levels that occur with hemolytic disease.

4- The pharmacologic management (Phenobarbital).

Nursing Considerations



A) Assessment

- Part of the routine physical assessment includes observing for evidence of jaundice at regular intervals.
- Jaundice is most reliably assessed by observing the infant's skin color from head to toe and the color of the sclerae and mucous membranes.
- Applying direct pressure to the skin, especially over bony prominences such as the tip of the nose or the sternum, causes blanching and allows the yellow stain to be more pronounced.
- For dark skinned infants, the color of the sclera, conjunctiva, and oral mucosa is the most reliable indicator.



B) Accurate charting

Is another important nursing responsibility and includes

- (1) times that phototherapy is started and stopped,
- (2) proper shielding of the eyes,
- (3) type of fluorescent lamp (by manufacturer),
- (4) number of lamps,
- (5) distance between surface of lamps and infant (should be no less than-18-inches),
- 6) use of phototherapy in combination with an incubator or open bassinet,
- (7) photometer measurement of light intensity, and
- (8) occurrence of side effects.



C) Family Support.

- Parents need reassurance concerning their infant's progress. All of the procedures are explained to familiarize them with the benefits and risks.
- Parents need to be reassured that the naked infant under the bilirubin light is warm and comfortable.
- Parents may be concerned about the eye shields, because "blindness" is a frightening experience.

- ***Prognosis.***
- Early recognition and treatment of hyperbilirubinemia prevents severe brain damage (bilirubin encephalopathy).



- **Reference**

- **Hockenberry, Marilyn J. II. Wilson, David, (2013) ,WONG'S ESSENTIALS OF PEDIATRIC NURSING 9TH EDITION Mosby, an imprint of Elsevier Inc. United States of America .**
- **CHAPTER 9Page 253-263**

Any questions?





Thanks