Neonatal Jaundice

Lead Author
Naveen Jain

Co-Authors
Ravi Sachan, Praveen Vaenkatagiri

Under the Auspices of the IAP Action Plan 2022

Remesh Kumar R
IAP President 2022

Upendra Kinjawadekar
IAP President-Elect 2022

Piyush Gupta
IAP President 2021

Vineet Saxena
IAP HSG 2022–2023
IAP Standard Treatment Guidelines Committee

Chairperson
Remesh Kumar R

IAP Coordinator
Vineet Saxena

National Coordinators
SS Kamath, Vinod H Ratageri

Member Secretaries
Krishna Mohan R, Vishnu Mohan PT

Members
Santanu Deb, Surender Singh Bisht, Prashant Kariya, Narmada Ashok, Pawan Kalyan
Neonatal Jaundice

Introduction

Physiological Jaundice

- Neonatal jaundice is common, occurring in 60% in term and 80% in preterm infants.
- Appears after 24 hours of life, decreases after 5–6 days, and undetectable after 14 days.
- Maximum values seldom exceed 15 mg/dL.

Severe Jaundice—Hyperbilirubinemia

- Any jaundice visible in first 24 hours of life
- Yellow staining of palms and soles or deep yellow appearance (measure bilirubin values using transcutaneous bilirubinometer or laboratory testing of serum sample, when in doubt)
- Bilirubin values >95 centile for gestation/weight/age in hours, evaluated on standard charts like the American Academy of Pediatrics (AAP) or National Institute for health and Care Excellence (NICE, UK) charts
- Warning signs of encephalopathy such as poor feeding and lethargy
Before discharge 24-72 hrs from birth

All babies must be evaluated clinically for bilirubin levels while in hospital and before discharge; and confirmed objectively when in doubt, by a transcutaneous bilirubinometer or serum bilirubin plotted on hour specific nomograms.

Kramer’s Criteria is helpful in clinical assessment of the severity of the jaundice. The clinical assessment requires natural light (can be faulty in hospital lighting). It also depends on experience of personnel and subjectivity of assessment (Fig. 1).

<table>
<thead>
<tr>
<th>Visual Assessment by Kramer Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Face</td>
</tr>
<tr>
<td>2. Upper trunk</td>
</tr>
<tr>
<td>3. Lower trunk and thighs</td>
</tr>
<tr>
<td>4. Arms and lower legs</td>
</tr>
<tr>
<td>5. Palms and soles</td>
</tr>
</tbody>
</table>

Fig. 1: Kramer’s criteria.

Use the hour-specific nomogram to evaluate risk before discharge from birth admission. Babies with values in high-risk zone must be re-evaluated within 24 hours (Fig. 2).

Fig. 2: Hour-specific nomogram. (TSB: total serum bilirubin)

After discharge (until day 5–6 of life) from hospital

- All babies reviewed within 48 hours and babies with higher risk within 24 hours of discharge for yellow staining of palms and soles or deep yellow appearance (measure values using transcutaneous Bilirubinometer or laboratory testing of serum sample, when in doubt, use specific charts such as AAP or NICE charts to evaluate need for treatment).

- Look for lactation problems (excess weight loss and delayed transition of stool to yellow color), infrequent stool, and urine.

- Exclude early signs of encephalopathy (poor feeding and lethargy)

Close follow-up (within 24 hours of discharge) is warranted in risk groups (Box 1).

**BOX 1: Risk groups: Need close attention.**

- Mother Rh-negative or O group
- Gestation of baby <38 completed weeks
- Lactation not established
- Predischarge bilirubin in high-risk zone (transcutaneous bilirubin >13 mg/dL)
- Cephalohematoma
- Previous baby with jaundice
- Glucose-6-phosphate dehydrogenase (G6PD) deficiency

- Gestational age and postnatal age (in hours)
- Birth weight and current weight
- Mode and adequacy of feeding
- Urine color and number of wet nappies
- Passage of meconium and color of stool
- Activity and behavior during sleep/waking up
- Any abnormal cry or body movements
- Any bleeding/bruising
- Mother’s blood group and baby’s blood group
- Previous baby with severe neonatal jaundice
Neonatal Jaundice

Prevention

Early initiation and frequent breastfeeding and/or early use of mother’s own milk (MOM) in neonatal intensive care unit (NICU).

Management

Hyperbilirubinemia is a potentially treatable condition. It may cause long-term neuro-developmental impairment, if not treated timely and appropriately.

Evaluation of a Baby with Hyperbilirubinemia

Investigations

- Total serum bilirubin (TSB)
- Mother and baby’s blood group (collect cord blood/venous sample immediately after birth, if mother’s blood group is Rh-ve)
- Suspected hemolysis: Complete blood count, reticulocyte count, peripheral blood smear, and direct Coombs’ test
- In areas of high prevalence: Screen for glucose-6-phosphate dehydrogenase (G6PD) deficiency
- For prolonged jaundice*: Total and direct bilirubin, thyroid function test, urine reducing substances, and culture. Ultrasound abdomen to exclude biliary atresia.

Examination

Feature of acute bilirubin encephalopathy (hypotonia and hypertonia, lethargy, high-pitched cry, poor suck, irritability, seizure, and opisthotonos posture)

*Prolonged jaundice: Visibly detectable jaundice beyond 2 weeks of age in a term and beyond 3 weeks of age in a preterm infant. Ask for pale stool or yellow urine, check for adequacy of weight gain. Do total and direct bilirubin test.
Reducing the level of serum bilirubin by intensive phototherapy and/or exchange transfusion. **Phototherapy** is a noninvasive, cost effective, safe, and easy to use method; it is available at all levels of neonatal healthcare. It should be started (after sending TSB) when jaundice appears within 24 hours and/or involving palm and soles; and if TSB is in range of phototherapy as per AAP or NICE charts. Stop phototherapy, if serum bilirubin level is 2–3 mg/dL lower than the phototherapy range (**Fig. 3**).

**Fig. 3:** Guidelines for phototherapy in hospitalized infants delivered at 35 or more weeks’ gestation. (TSB: total serum bilirubin)

Optimizing phototherapy:
- Use blue light and appropriate intensity of phototherapy (>30 µW/cm² per nm)
  - Light-emitting diode (LED) and compact fluorescent lamps (CFL) most often deliver the required intensity for a long duration. A periodic check of the intensity must be done to ensure efficacy (once in 6 months).
- Place phototherapy as close to baby as possible without causing hyperthermia
- Expose maximum area of body
- Ensure optimal breastfeeding and stool output

Indications for referral for potential exchange transfusion:
- Hyperbilirubinemia (as per AAP or NICE charts) not responding to intense phototherapy
- Any signs of early encephalopathy (poor feeding/lethargy) in babies with hyperbilirubinemia
- Babies with hyperbilirubinemia noted within 24 hours of life, preterm babies, and previous child requiring exchange transfusion or sick babies (sepsis) with hyperbilirubinemia are at risk of developing bilirubin associated neurologic damage at values less than that indicated on standard chart. They must be referred early to centers with facilities for exchange transfusion.

Exchange transfusion is a rapid, invasive, and effective method to reduce serum bilirubin. It is a specialized procedure, performed where facilities and skills are available. If facilities are not available, refer the baby along with mother's blood sample (if mother is not accompanying) (Fig. 4).

Types of blood used for exchange transfusion:
- Blood being used must be crossmatched with mother's blood.
- For Rh-isoimmunization: O-negative packed cells suspended in AB plasma or O-negative whole blood or Rh-negative baby’s ABO group after crossmatch.
- For ABO isoimmunization: O group (Rh-compatible) packed cell suspended in AB plasma or O group whole blood (Rh-compatible with baby) after crossmatch.
- In other situation, baby’s blood group should be used.
Neonatal Jaundice

**Treatment**

Fig. 4: Guidelines for exchange transfusion in infants 35 or more weeks’ gestation.


- The dashed lines for the first 24 hours indicate uncertainty due to a wide range of clinical circumstances and a range of responses to phototherapy.
- Immediate exchange transfusion is recommended if infant shows signs of acute bilirubin encephalopathy (hypertonia, arching, reticrocolis, opisthotonos, fever, high-pitched cry) or if TSB is ≥5 mg/dL (85 μmol/L) above these lines.
- Risk factors—isoimmune hemolytic disease, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis.
- Measure serum albumin and calculate B/A ratio.
- Use total bilirubin. Do not subtract direct reacting or conjugated bilirubin.
- If infant is well and 35–37 1/2 week (median risk) can individualize TSB levels for exchange based on actual gestational age.
Babies who had hyperbilirubinemia must be followed up periodically using development-screening tools until school age. The assessments should include early language milestones. Babies who had signs of encephalopathy or required exchange transfusion must have a hearing evaluation for sensorineural hearing impairment by brainstem-evoked audiometry before 6 months age.