

NEONATAL JAUNDICE

Introduction

Jaundice can be detected clinically when the level of bilirubin in the serum rises above 85 $\mu\text{mol/l}$ (5mg/dl)

Causes of neonatal jaundice

- haemolysis due to ABO or Rh isoimmunisation, G6PD deficiency, microspherocytosis, drugs
- physiological jaundice
- cephalhaematoma, subaponeurotic haemorrhage
- polycythaemia
- sepsis e.g. septicaemia, meningitis, urinary tract infection and intra-uterine infection
- breastfeeding and breastmilk jaundice
- gastrointestinal tract obstruction: increase in enterohepatic circulation

Table 1. Risk factors for bilirubin neurotoxicity

preterm infants
small for gestational age
sepsis
acidosis
asphyxia
hypoalbuminaemia
jaundice < 24 hours of age

Approach to an infant with jaundice

History

- age of onset
- previous infants with NNJ, kernicterus, neonatal death, G6PD deficiency
- mother's blood group (from antenatal history)
- gestation: the incidence of hyperbilirubinaemia increases with prematurity
- presence of abnormal symptoms such as apnoea, difficulty in feeding, feed intolerance and temperature instability

Physical examination

- general condition, gestation and weight, signs of sepsis, hydration status
- signs of kernicterus e.g. lethargy, hypotonia, seizure, opisthotonus, high pitch cry
- pallor, plethora, cephalhaematoma, subaponeurotic haemorrhage,
- signs of intrauterine infection e.g. petechiae, hepatosplenomegaly
- cephalo-caudal progression of severity of jaundice (see Table 2).

Table 2. Clinical assessment of neonatal jaundice (Kramer's rule)

Zone	Jaundice (detected by blanching the skin with finger pressure)	Estimated serum bilirubin ($\mu\text{mol/L}$)
1	head and neck	100
2	over upper trunk above umbilicus	150
3	lower trunk and thighs	200
4	over arms, legs and below knee	250
5	hands, feet	>250

Note: This may be difficult in dark skinned infants

Management

Indications for referral to hospital:

- jaundice within 24 hours of life.
- jaundice below umbilicus (corresponds to serum bilirubin 200-250 $\mu\text{mol/L}$)
- jaundice extending to sole of feet: **urgent referral, may need exchange transfusion**
- family history of significant haemolytic disease or kernicterus
- any unwell infant with jaundice
- prolonged jaundice more than 14 days (see chapter on Prolonged jaundice)

Investigations

- total serum bilirubin
- G6PD status
- others as indicated:
 - infant's blood group, maternal blood group, direct Coomb's test (indicated in Day 1 jaundice and severe jaundice)
 - full blood count, reticulocyte count, peripheral blood film
 - blood culture, urine microscopy and culture (if infection is suspected)

Treatment

Phototherapy

- phototherapy lights should have a minimum irradiance of 12 $\mu\text{W}/\text{cm}^2/\text{nm}$. Measure intensity of phototherapy light periodically using irradiance meters
- intensive phototherapy is above irradiance of 30 $\mu\text{W}/\text{cm}^2/\text{nm}$.
- position light source 35-50 cm from top surface of the infant (when conventional fluorescent photolights are used.)
- expose infant appropriately
- cover infant's eyes
- turn infant every 2 hours
- monitor serum bilirubin levels as indicated
- monitor infant's temperature 4 hourly to avoid chilling or overheating
- ensure adequate hydration
- allow parental-infant interaction
- discontinue phototherapy when bilirubin is 30 $\mu\text{mol}/\text{L}$ below phototherapy level.
- in infants without haemolytic disease, the average bilirubin rebound after phototherapy is less than 1 mg/dl (17 $\mu\text{mol}/\text{L}$). Discharge from hospital need not be delayed in order to observe the infant for rebound, and in most cases, no further measurement of bilirubin is necessary.
- turn off photolights during feeding and blood taking

Once the baby is on phototherapy, visual observation as a means of monitoring is unreliable. Serum bilirubin levels must guide the management.

Table 3. Guidelines for phototherapy and exchange transfusion (ET) in hospitalized infants of ≥ 35 weeks' gestation (derived from fig 1)

Hours of life	Total Serum Bilirubin levels mg/dL ($\mu\text{mol}/\text{L}$)					
	low risk (≥ 38 wk and well)		medium risk ≥ 38 wk + risk factors <i>or</i> 35-37 6/7 wk and well		high risk (35-37 6/7 wk + risk factors)	
	Intensive phototherapy	ET	Intensive phototherapy	ET	Intensive phototherapy	ET
< 24*						
24	12 (200)	19 (325)	10 (170)	17 (290)	8 (135)	15 (255)
48	15 (255)	22 (375)	13 (220)	19 (325)	11 (185)	17 (290)
72	18 (305)	24 (410)	15 (255)	21 (360)	13 (220)	18.5 (315)
96	20 (340)	25 (425)	17 (290)	22.5 (380)	14 (240)	19 (325)
> 96	21 (360)	25 (425)	18 (305)	22.5 (380)	15 (255)	19 (325)

1. start conventional phototherapy at TSB 3 mg/dL (50 $\mu\text{mol}/\text{L}$) below the levels for intensive phototherapy.

2. Risk factors – isoimmune hemolytic disease; G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis or albumin < 3.0 g/dL

*Infants jaundiced at < 24 hours of life are not considered healthy and require further evaluation

Intensive phototherapy indications:

- total bilirubin > 300 $\mu\text{mol/L}$
- early onset jaundice (first 48 hours)
- rapidly rising jaundice (more than 8.5 $\mu\text{mol/L/hr}$)

Additional notes:

- immediate exchange transfusion is recommended if infants show signs of acute bilirubin encephalopathy (hypertonia, arching, retrocollis, opisthotonus, fever, high pitch cry) or if TSB is $\geq 5 \text{ mg/dL}$ (85 $\mu\text{mol/L}$) above the exchange levels stated above.
- use total bilirubin level. Do not subtract direct reacting or conjugated bilirubin.
- during birth hospitalisation, ET is recommended if the TSB rises to these levels despite intensive phototherapy
- for readmitted infants, if the TSB level is above the ET level repeat the TSB measurement every 2 to 3 hours and consider ET if the TSB levels remain above the ET level for 6 hours under intensive phototherapy
- infants who are of lower gestation will require phototherapy and ET at lower levels, (please check with your specialist)

Measures to prevent severe neonatal jaundice

- inadequate breast milk flow in the first week may aggravate jaundice. Supportive measures should be there to promote successful breastfeeding. Supplements may be needed temporarily to ensure adequate hydration.
- interrupting breastfeeding in healthy term newborns is discouraged; frequent breastfeeding (8-10 times every 24 hours) should be continued. Supplementation with milk formula with or without phototherapy can be considered. Supplementing with water or dextrose water does not lower bilirubin level in healthy, breast-feeding infants.
- determine G6PD status before discharge. If deficient, baby should be observed for 5 days
- infants of mothers with blood group "O" and with a sibling who had severe neonatal jaundice should be observed for at least the first 24 hours of life.
- arrange follow-up for all neonates discharged < 48 hours after birth with a health care professional in an ambulatory setting, or at home within 2-3 days of discharge

Table 4. Agents to be avoided in patients with G6PD Deficiency

Foods and Herbs to be avoided	Drugs that can be safely given in therapeutic doses	
Fava Beans (Kacang Parang)	Paracetamol	Trimethoprim
Documented Chinese herbs/medicine	Ascorbic Acid	Tripeleennamine
<i>Chuen Lin</i>	Aspirin	Vitamin K
<i>San Chi</i>	Chloramphenicol	Mefloquine
<i>13 herbs</i>	Chloroquine	Drugs to be avoided or contraindicated
<i>12 herbs</i>	Colchicine	
Other traditional herbs/medications are also not to be taken unless with medical advice	Diphenhydramine	
	Isoniazid	
	Phenacetin	
	Phenylbutazone	
	Phenytoin	
	Probenecid	
	Procainamide	
	Pyrimethamine	
Other chemicals to be avoided	Quinidine	
Naphthalene (moth balls)	Streptomycin	Acetanilide
Mosquito coils and insect repellants which contains pyrethium	Sulfisoxazole	Doxorubicin
		Furazolidene
		Methylene Blue
		Nalidixic acid
		Niridazole
		Nitrofurantoin
		Phenozopyridine
		Primaquine
		Sulfamethoxazole
		Bactrim

Fig 1: Guidelines for intensive phototherapy in infants ≥ 35 wks gestation

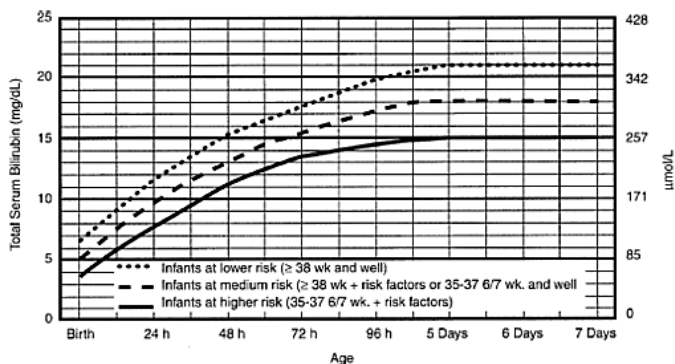
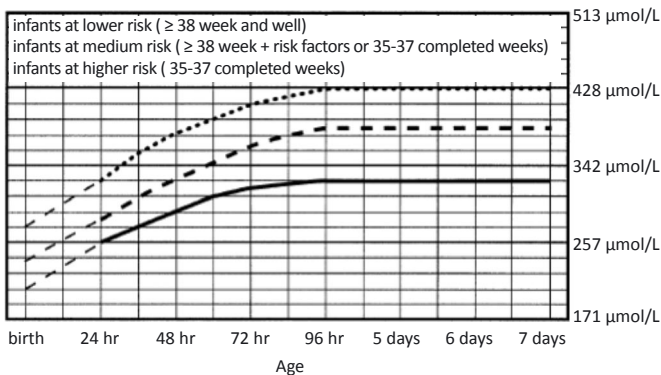


Fig 2: Guidelines for exchange transfusion in infants ≥ 35 wks gestation



1. 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
2. Immediate exchange transfusion is recommended if infant shows signs of acute bilirubin encephalopathy (hypertonia, arching, retrocollis, ophisthotonus, fever, high pitched cry) or if total serum bilirubin is ≥ 5 mg/dL (85 $\mu\text{mol/L}$) above these lines