Jaundice

- Jaundice is a SYMPTOM NOT a Disease

Jaundice means yellow

"a yellow discolouration of the skin, mucous membranes, and/or sclerae of the eyes, that results from raised levels of bilirubin in the blood (Hyperbilirubinaemia)

The cause of the jaundice may be either

- physiological
- Pathological
  - Infections: septicemia
  - TORCH infection
  - Hemolytic disease of the newborn : Rh, ABO and other blood group incompatibility
  - Extravasated blood in the form of large bruise
  - , cephalhaematoma,
  - subaponeurotic hemorrhage, etc.
  - Congenital hypothyroidism
  - Neonatal hepatitis syndrome,

Bilirubin

- Bilirubin is produced by the normal breakdown of red blood cells (RBC's) this happens when they age, are immature or malformed or are no longer required
- Neonates have high levels of RBCs with fetal haemoglobin no longer required now breathing air
- They are broken down quickly in the first weeks after birth.

Production of bilirubin

The neonate produces about twice as much bilirubin as an adult

Because

- high levels of RBCs with fetal haemoglobin no longer required now breathing.
- Neonates have more RBC's than adults
- Erythrocyte lifespan is shorter
- Less efficient RBC production
- Meconium contains up to 175g bilirubin

There are two forms of bilirubin found in our bodies

Unconjugate and conjugated.

- ***Unconjugated,*** cannot be excreted easily from the body via urine or bile, as it is fat soluble.
- It is deposited in the connective tissue of the skin, with excess levels giving rise to the characteristic skin yellowing.
- If there is not enough albumin to bind the bilirubin it enters the systems as "free bilirubin" in this form it is more likely to enter the tissues.

(NB. remember because unconjugated bilirubin is fat soluble it is able to cross the blood-brain barrier and therefore cause irreversible toxicity – kernicterus*).*

- **S . Bilirubin: Total, indirect and direct**

S Bilirubin level	**normal range**
Total	0.1 - 1.2 mg/dl
Direct or Conjugated	Less then 0.3mg /dl (water soluble and Normal)
Indirect Non Conjugated	02.-0.8 0.3mg /dl (fat soluble Diseases condition)

- Blood grouping of the baby and mother- ABO and Rh
- Hb%, CBC, Peripheral blood film, Reticulocyte count, Coomb, s test

(other investigations may include sepsis screen, thyroid function test, LFTs, Ultrasonography of abdomen etc.)

	Healthy bilirubin range	**High bilirubin range**
Less than 24 hours	<6.0 mg/dL	6.0 mg/dL
24–48 hours	<10.0 mg/dL	10.0 mg/dL
3–5 days	<12.0 mg/dL	12.0 mg/dL
7 days	<10.0 mg/dL	10.0 mg/dL
Adults	0.3–1.0 mg/dL	2.5 mg/dL

1 mg/dL = 0.01131222 µmol/L · 2 mg/dL = 0.02262443 µmol/L · 3 mg/dL = 0.0339366 5 µmol/L · 4 mg/dL = 0.04524887 µmol/L · 5 mg/dL = 0.05656109 µmol/L · 6 mg/dL =.

How do you convert umol L to mg dL?

To convert µmol/l to mg/dl, multiply by 0.0113. To convert mg/dl to µmol/l, multiply by 88.4.

Types of Neonatal Jaundice

- Physiological

- one of the most common physiological problems in the newborn
- part of the normal physiology of the neonate

- **Pathological**
  - arises from factors that alter the neonates usual processes

Physiological Jaundice

- A normal state that occurs in up to 60% of term infants (and 80% preterm) as a consequence of the transition from intrauterine to extrauterine life.
- In order to obtain sufficient oxygen from the placental circulation the fetus produces a greater number of RBC's, hypoxia is the stimulus for this and leads to erythropoietin release stimulating the RBC production.
- At birth this excess is not required as they breathe air with a high oxygen level and therefore erythropoietin release is reduced, leading to RBC breakdown and destruction and therefore an increased bilirubin load on the immature liver.
- In addition there is much conjugated bilirubin in the bowel, already present in meconium and this may be broken down to release free bilirubin again which then re-enters the baby's circulation.

Characteristics of physiological jaundice

- does not appear before 24 hours of age
- generally appears at two to four days
- peaks on day three to five
- usually self-resolves by one to two weeks
- the baby is usually well but may be less alert
- bilirubin does not usually exceed 220 μmol/l
- has no underlying pathology

- usually clinically apparent when SBR is/above 85µmol/l

Physiological jaundice may be made worse by situations that cause increased bilirubin production or decreased bilirubin excretion **:**

- ❑ polycythaemia, increased number of red blood cells
- ❑ Ecchymosis (bruising) ie: chignon, cephalhaematoma
- ❑ delayed/poor feeding, therefore decreased output and in turn delayed intestinal emptying. The longer conjugated bilirubin remains in the gut the more likely it is to be converted back.
- ❑ sepsis, alters liver function
- ❑ decreased . albumin-binding capacity, eg: diazepam occupy albumin binding sites (this may happen in woman has been eclamptic and diazepam has been used)

Two main reasons for physiological jaundice

- Increased red blood cell break down
- Immature liver

Prevention and Production of physiological jaundice

- Early frequent feeding : increases gut motility and intestinal flora and reduces enterohepatic shunting
- Neutral environment : reduces the risk of hypothermia which can interfere with albumin binding and release of free fatty acids
- Avoid trauma to the baby
- Prevent hypoglyceamia
- Prevent hypothermia
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Pathological Jaundice

- Jaundice appearing usually within 24 hours of birth due to an underlying cause.
- Three main causes
  - Increased RBC breakdown (haemolysis)
    - eg. haemolytic disease of the newborn, G6PD deficiency
  - Failure of the ability to conjugate bilirubin
    - eg. genetic reasons,
  - Increased enterohepatic circulation

- eg. congenital hypothyroidism

Infants at Risk of Pathological jaundice

- Premature
- Delayed feeders
- Birth Trauma
- Infection
- Blood group incompatibility
- Enzyme deficiencies eg: G6PD
- Congenital abnormalities of intestinal tract
- Delay in passing meconium

Management of neonatal jaundice

✧ **history taking**

- Age of the Child
- Birth weight
- Gestational age
- Time of onset of jaundice
- Mother's blood group
- History of jaundice in the previous child
- Any sign/symptom of infection
- Duration of jaundice
- Colour of the stool and urine
- Maternal H/O fever, rash or jaundice during the ante natal period

- physical examinations,
- investigations, treatment and follow up.

The main objective of management is to prevent kernicterus (Brain damage)

irrespective of cause and to identify the oetiology.

Physical examination:

- The baby should be examined under good daylight. Examine the baby for yellow discoloration of the skin, mainly in the trunk, palms and soles
- . During the examination: **1)** expose the area; **2)** press it with your fingers; and **3)** then withdraw the fingers and note the color of the skin.
- yellow discoloration of the skin, extending to the

- trunk, palms and soles
- Hydration status
- any sign of infection
- Problem
- **Estimate the severity of jaundice: -**
- observed in artificial light and may be missed in poor light;
- Lightly press the skin with a finger to reveal the underlying colour of the skin and subcutaneous tissue;

Clinical estimation of severity of jaundice

Age	**Jaundice Visible on**	**Classify as**
Day 1	Any visible jaundice[a]	Serious jaundice
Day 2	Arms and legs	Serious jaundice
	the hands and feet in addition to the arms and legs	very serious
Day 3	Hands and feet and thereafter	

physiological jaundice

- Jaundice appears second day onward
- Jaundice may be upto the trunk
- Baby remains otherwise healthy
- Jaundice clears spontaneously within 7-10 days of life

Pathological jaundice

Jaundice appearing within 48 hours or persisting
after 2nd week of life
visible jaundice reaching to palm and sole
Jaundice with any sign of infection
Janndice with pale stool
Baseline investigations

Clinical jaundice of the face approximately corresponds to a bilirubin level of 5mg/dl, that of trunk up to umbilicus to

10-15mg/dl and visible jaundice reaching to palm and sole to 2o mg/dl.

Treatment of neonatal jaundice

Phototherapy

Exchange transfusion

Treatment of underlying cause

Treatment /Management

- H/o taking
- Physical examination
- Investigation

physiological jaundice

- No specific treatment is required unless bilirubin rises to a high level
- Reassurance and encourage breastfeeding on demand .

Pathological jaundice

Phototherapy

Exchange transfusion

Treatment of underlying cause e.g. sepsis section)

Encourage mother to breastfeed on demand

On phototherapy, If the baby is receiving I/V fluid or expressed breast milk, increase the volume of fluid and /or milk by 10%-20% of the total volume per day.

Phototherapy

Phototherapy is **treatment with a special type of light (not sunlight)**. It's sometimes used to treat newborn jaundice by making it easier for baby's liver to break down and remove the bilirubin from baby's blood. Phototherapy aims to expose baby's skin to as much light as possible .

M/a **Phototherapy** converts bilirubin that is present in the superficial capillaries and interstitial spaces of the skin and subcutaneous tissues to water-soluble isomers that are excretable without further metabolism by the liver .

Neonatal jaundice expert Maisels suggests that phototherapy is much like a percutaneous drug.

When phototherapy illuminates the skin, an infusion of discrete photons of energy are absorbed by bilirubin like a drug molecule binds to a receptor.

Bilirubin molecules in light-exposed skin undergo relatively quick photochemical reactions—configurational isomerization,

S ide effects of phototherapy in babies

- The short-term side effects of phototherapy include interference with maternal-infant interaction,
- imbalance of thermal environment
- water loss, electrolyte disturbance,
- bronze baby syndrome
- circadian rhythm disorder.

PREPARING THE PHOTOTHERAPY UNIT

- Ensure that a plastic cover or shield is in position. This prevents injury to the baby in case a lamp breaks and helps to screen out harmful ultraviolet light.
- Warm the room where the unit is located, if necessary, so that the temperature under the lights is 28 °C to 30 °C.

- ✧ Switch on the unit, and ensure that all the fluorescent tubes are working.
- ✧ Replace fluorescent tubes that are burned out or flickering:
- ✧ Record the date the tubes were replaced, and measure the total duration of use of the tubes;
- ✧ Replace tubes every 2000 hours of use or after three months, whichever comes first, even if the tubes are still working.
- ✧ Use white linens in the cot, bassinet, or incubator, and place white

curtains around the area where the unit is located to reflect as much light as possible back to the baby

GIVING PHOTOTHERAPY

- ❖ Place the baby under the phototherapy lights
- ❖ If the **baby weighs 2 kg or more**, place the baby naked in the cot or bassinet.
- ❖ Place or keep smaller babies in an incubator;
- ❖ Place the baby as close to the lights as the manufacturer's
- ❖ instructions allow;
  - Cover the baby's eyes with patches,
  - ensuring that the patches do not block the baby's nostrils.
  - Do not secure the patches in place with tape.

❖ Baby under phototherapy lights

- ✓ Turn the baby every three hours.
- ✓ Ensure that the baby is fed:
- ✓ Encourage the mother to breastfeed on demand but at least every

three hours:

- ✓ During feeding, remove the baby from the phototherapy unit

and remove the eye patches;

- ✓ There is no need to supplement or replace breast milk with any

other type of feed or fluid (e.g. breast-milk substitute, water, sugar water, etc.)

- ❖ If the **baby is receiving IV fluid or expressed breast milk**,

increase the volume of fluid and/or milk by 10% of the total daily volume per day for as long as the baby is under the phototherapy lights;

- ❖ I**f the baby is receiving IV fluid or is being fed by gastric tube, do not remove the baby from the phototherapy lights**.

❖ Note that the baby's stool may become loose and yellow while the baby is receiving phototherapy. This does not require specific treatment.

Continue other prescribed treatment and tests:

❖ Remove the baby from the phototherapy unit only for procedures that cannot be performed while under the phototherapy lights;

❖ If the **baby is receiving oxygen**, briefly turn off the lights when observing the baby for central cyanosis (blue tongue and lips).

Jaundice

❖ Measure the baby's temperature and the temperature of the air under the lights every three hours.

❖ If the **baby's temperature is more than 37.5 °C**, adjust the temperature of the room or temporarily remove the baby from the phototherapy unit until the baby's temperature is 36.5 °C to 37.5 °C.

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❖ **Measure serum bilirubin level every 12 hours**:

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✓ Discontinue phototherapy when the serum bilirubin level is below the level at which phototherapy was started or 15 mg/dl (260 μmol/l), whichever is lower;

✓ If the **serum bilirubin is close to the level requiring exchange transfusion** , organize transfer , and urgently refer the baby to a tertiary hospital or specialized centre for exchange transfusion, if possible. Send a sample of the mother's and the baby's blood.

❖ **If the serum bilirubin cannot be measured, discontinue phototherapy after three days.**

Bilirubin in the skin rapidly disappears under phototherapy. Skin colour cannot be used as a guide to serum bilirubin level while the baby is receiving phototherapy and for 24 hours after discontinuing phototherapy.

➢ After phototherapy has been discontinued:

➢ Observe the baby for 24 hours, and repeat the serum bilirubin measurement, if possible, or estimate jaundice using the clinical

method s

- If **jaundice has returned to or is above the level at which phototherapy was started**,

✓ repeat phototherapy for the same length of time as originally given.

✓ Repeat this step each time phototherapy is discontinued until the measured or estimated bilirubin stays below the level requiring phototherapy.

✓ If phototherapy is no longer required, the baby is feeding well, and there are no other problems requiring hospitalization, discharge the baby

✓ Teach the mother to assess jaundice, and advise her to return if the baby becomes more jaundiced.