Recognizable jaundice appears in about 60% of newborns in their first week of life. More then 90% of them are simple physiological jaundice” almost disappears by 3rd week of life and needs no intervention. But in these cases parents and relatives may have undue anxieties like- is it dangerous? infectious? transmitted from mother? and so forth. So, we need to have very clear idea about distinguishing physiological or benign jaundice from pathological or harmful jaundice. Failure of which still result in undue prolonged morbidity, mortality and very delayed referral.

Very careful history taking, physical examination and simple tests, if available can solve this problem.

Pathophysiology of Physiological Jaundice in the Newborn

In utero the foetus has to derive its total nutrition and oxygen from maternal blood perfusing the placental villae. This blood is about 60-70% saturated with oxygen, that is it contains less oxygen than that we inhale in our lungs. So to maintain proper oxygenation of the very rapidly growing tissues of the foetus the foetal blood has special characteristics to extract as much as possible oxygen from the maternal blood.

Foetal haemoglobin is different from adult haemoglobin and has higher affinity for oxygen and also the amount of haemoglobin in the foetus is about 60% more (18-20 gms/dl of blood) than in adult.

After birth, when the newborn starts breathing and receives oxygen directly from the air through his/her lungs, he/she no more requires those especially designed and excess haemoglobin to maintain oxygenation and metabolism of his/her tissues. At this time the redundant haemoglobin tends to rapidly breakdown and be cleared from the circulation. The life span of foetal R.B.C. is also less (80-90 days) than that of adult R.B.C.s so they breakdown rapidly and in large amounts. During this period the bone marrow finding no necessity to produce much R.B.C.s, takes some rest and functions minimally for several weeks.

The breakdown of this excess red cells & their haemoglobin produces excessive amounts of bilirubin pigments (35 mgm of bilirubin is liberated from 1 gm of haemoglobin) and is presented to the yet to fully mature liver (structurally and enzymatically) to handle this bilirubin load for conjugation and excretion.

As the load of bilirubin gradually increases to beyond capacity of the liver to conjugate, clinically apparent jaundice appears.

In a normal full term baby by day 7 to 10 there is usually balance between production and excretion of bilirubin and the jaundice gradually disappears.

In a pre-term baby this process of maturity takes some longer time and the jaundice usually disappears between 15-20 days of life unless some other complication arises.

So, Physiological Jaundice will have following Features

a. Will clinically be evident after 2-3 days of birth.

b. The jaundice will gradually increase for 4-5 days.

c. Will gradually decline spontaneously after one week of age and be almost unnoticeable after 2 weeks of age.
d. Stool colour of the baby will be normal (yellowish).
e. The baby's activity including sucking, swallowing will remain normal.

But if the features are otherwise as stated below, investigations are indicated

**Pathological Jaundice**

About ten percent of the clinically apparent neonatal jaundice may be outside the physiological domain and require investigations and active management.

The principal reasons for this abnormal neonatal jaundice are:

a. 1) Excessive haemolysis, eg. Blood group incompatibility (Rh incompatibility, ABO, incompatibility, Minor group incompatibility)
   2) Enzyme deficiencies, eg. GOPD deficiency
   3) Haemoglobinopathis, eg. X-thalassaemia
   4) From sequestrated blood, eg. Cephalhaematoma, Multiple bruises

b. Infections like septicaemia.
c. Impaired enterohepatic circulation, e.g., Intestinal obstruction, hypertrophic pyloric stenosis.
d. Obstruction to biliary flow.
e. Immaturity/ congenital absence of enzymes.

**Features of Pathological Jaundice include**

a. Jaundice appearing within day one or two of birth.
b. Increases very rapidly.
c. The Jaundice appears to be very high at any time (the lower limbs and soles being prominently yellow)
d. The jaundice don't start decreasing clinically after 7-10 days of age.
e. The baby is sick otherwise with less activity -poor feeding, fever, vomiting, unhealthy umbilicus etc.
f. The stool color of the baby is pale.

Before sending blood for investigations the baby should be very carefully examined for signs of infection, injury, haematoma, hepatosplenomagaly, rashes, etc.

Following simple investigations will give clue to the diagnosis in more than ninety percent cases of neonatal jaundice:

* Mother's Blood group.
* Baby's Blood group, Hb%,
* Direct Coomb's test
* Peripherial film, Reticulocyte count.
* S. bilirubin
  Total (Direct and indirect)

If the direct bilirubin is predominantly high the following possibilities need to be considered-

- Sepsis - Congenital metabolic problem like galactosaemia •Hepatitis •Biliary atresia •Rubella, Toxoplasma, CMV. •α -antitrypsin deficiency.
- Choledochal cyst. •Transplacental infections, congenital etc.

If the indirect or unconjugated bilirubin is predominantly high the following flow chart will help in reaching diagnosis.

After the initial tests further investigations should be done depending on the possibility, e.g-for suspected biliary atresia-
ultrasonogram of hepatobiliary system and HIDA scan, for congenital infection- TORCH screening etc.
Clinical Assessment
So, whenever a neonate is brought with jaundice we should carefully take the history including the day it was first noticed, other associated features, mother's blood group, and very careful examination of the baby from head to toe. Clinical Assessment of jaundice should made in open day light. Gentle pressure over the skin of face, trunk, limbs will give idea about the degree of jaundice. If the jaundice is mainly limited to the face, chest and abdomen- it is likely to be mild to moderate (bilirubin usually bellow 10-12 mgm/dl). If the lower limbs soles and palms are yellow prominently it is usually moderate to high jaundice (bilirubin usually above 15mgm/dl). Our clinical experience correlates with this observation. So at places where serum bilirubin estimation is not easily available, this guideline may be used to decide whether a neonate with jaundice should be referred to a centre where proper investigations and management are available.

If there is strong suspicion of biliary atresia on the basis of high direct bilirubinaemia, pale stools, the baby should urgently be referred to a place where surgical intervention is possible. Because early diagnosis and surgery has high degree of success and good prognosis and delay of only six to eight weeks will cause irreversible damage to the liver.

Management
Physiological jaundice-requires reassurance to parents, encouragement for frequent breast feeding to avoid dehydration.

Early morning sun-bath for 15-30 minutes will accelerate the disappearance of jaundice and parents may like to do this but is not essential.

Phototherapy
Special blue light of wave length spectrum 420-470 nm. has been shown to make the indirect bilirubin water soluble by isomerization and photoxidation. Exposure of the baby's skin to this light hastens bilirubin elimination.

All cases of indirect hyperbilirubinaemia will benefit from this bili-light therapy.

The eyes and gonadal areas of the baby should be covered during therapy to avoid possible damage from ultraviolet light.

Use of ordinary light bulb for phototherapy is crude and only a fraction of this light has that specific wave lengths, so the effectiveness is less than the specially prepared bulbs for phototherapy (bili-light bulbs). These bulbs are now available in our country.

It has been observed that intermittent phototherapy works almost as good as continuous phototherapy. So it is advised to give some rests, usually during and a while after feeding.

It should not be prescribed with hard fast rule of 45 minutes exposure and 15 minutes rest- it is just a guide line. During initial exposure baby quickly becomes irritable and cannot withstand the light more than only a few minutes but gradually he/she becomes accustomed. So the therapy period may need to be gradually increased and also, if the baby is found sleeping under the light, it is illogical to awaken him and bring out of therapy. Both sides of the body should be exposed to light by turning him/her from time to time.

Baby's temperature should be noted as frequently as possible to avoid hypo or hyperthermia. Some 20-30ml per Kg body weight extra fluid will be needed during the course of phototherapy. Some loose stools and macular rash are acceptable minor side-effects.

If a jaundiced baby has some fever, feeding difficulty, vomiting, abdominal distention etc. infection should be highly suspected and looked for by doing a W.B.C. count, blood C/S and antibiotic should be started.

Exchange Transfusion
If a full term baby is found to have indirect bilirubin of more than 25 mg/dl or a pre-term baby with indirect bilirubin of 20mg/dl or more, he/she should be urgently referred to a place where exchange transfusion can be done.
Baby of Rh negative mother with rapidly increasing jaundice should also be referred for early exchange transfusion.

**Breast Milk Jaundice**

Some mother's milk contain excessive amount of a progestational hormone (β-pregnendiole) which competes with bilirubin in the hepatocellular conjugation process, so indirect bilirubin remains high for prolonged period. The baby is otherwise healthy, sucks well and grows well. Blood investigations will show no abnormality. If one highly suspects breast milk jaundice and wishes to confirm it for parents satisfaction, estimation of S. bilirubin before and after temporary withholding of breast milk for about 24 hours will show a significant decline in bilirubin level. Management is only explanation and reassurance to parents. Breast feeding should never be stopped for this.

Explanation of the disease to the parents is very very important and should never be ignored.

So, simple but stepwise judicious approach to a case of neonatal jaundice is, what is required for its proper and effective management.