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# EFFECTOF PHOTOTHERAPY IN NEONATAL JAUNDICE PATIENTS

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**ABSTRACT**
The study of phototherapy should be demonstrated in order to provide the better patient compliance for the children and neonates to minimize the side effects. According to our survey no side effects have been reported. We have gone through many hospitals and meet the pediatricians to investigate the effects of phototherapy in addition we came to known that phototherapy is given based on the total serum bilirubin levels. Phototherapy is given in two ways i.e., single surface phototherapy and double surface phototherapy. Here two types of bilirubin count to be taken firstly total serum bilirubin level and direct bilirubin level. Normally the serum bilirubin level are high from day of birth 3 to 5 days and eventually the serum levels get dropped by well breast feeding and exposure to sunlight. Now a days breast feeding and exposure to sunlight are the most commonly preferred than phototherapy treatment. About 30% of the 11 to 15 days neonates are rendered to jaundice and no one can don't show the prominent change in the weight of neonates. 95% of the cesarian and only 5% of the normal delivery have been reported.

**KEYWORDS:** Hyperbilirubinemia, unconjugated-hyperbilirubinemia, conjugated-hyperbilirubinemia, hypothermia, encephalopathy, riboflavin, dehydrogenase deficiency, hepatocellular damage, spherocytosis.

## INTRODUCTION

Neonatal jaundice or neonatal hyperbilirubinemia result from elevated total serum bilirubin(TSB) and clinically manifests as yellowish discoloration of the skin, sclera, and mucous membrane. It is a mild, transient, and self-limiting conditions & is referred to as "physiological jaundice". The term jaundice derives from the French word "jaune" which means yellow. It is the most commonly encountered medical problem in the 1st two weeks of life and a common cause of read mission to the hospital after birth. Approximately 60% of term & 80% of preterm newborns develop clinical jaundice in the 1st week after birth.[1]

However it is imperative to distinguish this from a more severe form called pathological jaundice. Failure to identify and treat this entity may result in bilirubin encephalopathy and associated neurological sequelae.

Unconjugated hyperbilirubinemia is the cause of clinical jaundice in most neonates but some infants have conjugated hyperbilirubinemia, which is always pathological & signifies an underlying medical or surgical cause. The etiology of pathological UHB & CHB is vast and varied. Preterm infants and those born with congenital enzyme deficiencies are particularly prone to the harmful effects of unconjugated bilirubin on the central nervous system.[2]

Severe Hyperbilirubinemia can cause bilirubin induced neurological dysfunction (BIND) and if not treated adequately may lead to acute & chronic bilirubin encephalopathy. Phototherapy & exchange transfusion are the mainstay of the treatment of UHB, and a subset of patients also respond to intravenous immunoglobulin (IVIG). Treatment of CHB is more complex and depends mainly on the etiology, despite advance in care and management of hyperbilirubinemia, it remains a significant cause of morbidity & mortality.[3]

### Phototherapy

Phototherapy is a use of visible light for the treatment of hyperbilirubinemia in the new born this relatively common therapy lowers the serum bilirubin level by transforming bilirubin into water soluble isomers that can be eliminated without conjugated in the liver.

The dose of phototherapy largely determines how quickly it works, the dose in turn is determined by the light (irradiance). The distance between the light and the infant, and the body surface area exposed to the light. Commercially available phototherapy system include those that deliver light via fluorescent bulbs, and fiberoptic mattresses. Proper nursing care enhance the

effectiveness of phototherapy and minimizes complications.

Caregiver responsibilities include ensuring effective irradiance delivery, maximizing skin exposure, providing eye protection & eye care, carefully monitoring thermoregulations, maintaining adequate hydration, promoting elimination and supporting parent infant interactions.[4]

Phototherapy is a treatment for jaundice where the exposure of skin to a light source converts unconjugated bilirubin molecules into water soluble isomers that can be excreted by the usual pathway. Blue-green light is most effective for phototherapy as it both penetrates the skin and is absorbed by bilirubin to have the photochemical effect.

**Phototherapy Technique**

- Perform hand wash
- Place baby naked in cradle or incubators
- Fix eye shades
- Keep baby at least 45cm from lights start phototherapy
- Temperature record 2-4hrs
- Weight recorded daily
- Monitor urine frequency
- Monitor bilirubin level

**Clinical Problems**

Sometimes 60% of neonatal have clinically jaundiced during the first week of life. Unconjugated bilirubin (indirect bilirubin) is the result of excessive bilirubin levels as the neonatal body is not fully developed to clear out the bilirubin levels.

Although most newborn infants are healthy otherwise but require the monitoring of bilirubin levels from time to time to avoid CNS complications like bilirubin encephalopathy subsequently kernicterus with devastating, permanent neurodevelopmental handicaps.

**Pathophysiology**

In general, bilirubin is cleared out by conjugated of bilirubin with glucuronic acid and eliminate in the bile as the bilirubin glucuronides. Neonatal jaundice occurs mostly because of lack of conjugation and increased turnover of red blood cells.

**Long-term effects**

Phototherapy separates a child from the mother and interferes with maternal-child bonding. It can affect the neonate's auditory and visual alertness and make parents anxious. In studies, it was reported that neonates who undergone phototherapy were significantly are in orientation responses to visual inanimate, visual animate, and visual and auditory animates in cluster interactive process. In some other studies, it was found that36% of mothers have positivity towards the use of filtered sunlight phototherapy as they get an opportunity to feed and have a bond with their babies while receiving this type of treatment.

**Short-term effects**

Newborn is placed in the diaper for maximum exposure and may develop hypothermia if the room temperature is not maintained, as phototherapy is not well designed to provide a comfortable environment for the baby. High irradiance phototherapy results in hyperthermia which in turn increases the blood flow in capillaries of the skin and muscles which can lead to overheating if the neonates is placed in a warmer or incubator during phototherapy. In some studies, it was mentioned the incidents of hyperthermia were greater in the LED group than in the fluorescent group. In another study conducted on body temperature variations of the newborn under fluorescent versus LED phototherapy, in which the newborn receiving LED phototherapy of 60-120 microwatts\centimeter (2)\nm was greater ($p<0.001$) from the other group who received fluorescent lamps(10-15 microwatts\cm(2)\nm irradiance) and LED phototherapy of 20-60 microwatts\cm(2)\nm irradiance.

**Side effects of phototherapy in neonate hyperbilirubinemia**

Blue light has been widely used for the treatment of neonatal hyperbilirubinemia since the 1950s. neonatal phototherapy can decrease plasma unconjugated bilirubin level[5], thus preventing bilirubin encephalopathy, & generally reduce the exchange transfusion rate.

Riboflavin deficiency; riboflavin present in all types of cells in the body. So, when a baby is exposed to phototherapy it degrades riboflavin which result in deficiency of glutathione reductase in erythrocytes and which further results in red blood cell hemolysis. In rarer conditions term neonates require supplementation of riboflavin during phototherapy.

DNA damage; phototherapy damages the DNA by oxidative injury to the cell membrane, increase in liquid peroxidase products. this overall increases the free radicals in the body causes damages to DNA strands and may result in mutation over a course of time.

Jaundice is the most common type of problem noticed in the first few weeks of babies life. May be it is due to the cause of concern for the physician and the anxiety for the parents. About 60% of terms newborn visible jaundiced in the first week of life. In most cases, it is benign and no interventions are followed. Approximately 5-10% of them have clinically significant hyperbilirubinemia which is at the stage of the requirements of phototherapy.

**Breastfeeding jaundice**

Breastfeeding infants have peculiar ways of physiological jaundice when compared to artificially fed babies. In breastfed babies, jaundice is usually noticed between 24-72hrs of age, peaks by 5 to 15 days of life, and resolves by the third week of life.

Breastfeeding jaundice is caused by insufficient breast milk intake[6], resulting in inadequate quantities of bowel movements to remove bilirubin from the body. This leads to increased enterohepatic circulation resulting in increased reabsorption of bilirubin from the intestine. Usually occurring in the first week of life, most cases can be ameliorated by frequent breastfeeding session of sufficient duration to stimulate adequate milk production.[7]

**Breast milk jaundice**

Breast milk jaundice is a type of jaundice that occurs in neonates due to breastfeeding. It happens within the first week of life due to the abnormal accumulation of bilirubin, causing a yellowish discoloration to the neonates skin known as jaundice. This activity reviews that evaluation & treatment of breast milk jaundice & explain inter-professional team members role in managing patients with this condition.[8]

In breastfed term babies 2 to 4% have jaundice over 10mg\dl in the third week of life. In this type of baby with total serum bilirubin levels, greater than 10mg\dl after the third week of life should be suggested for further investigations for prolonged jaundice. If the total serum bilirubin is predominantly unconjugated then it is diagnosed as breast milk jaundice, other causes of jaundice have been excluded and the infant in a proper health condition. Mothers should be advised to continue breastfeeding at frequent intervals which decline the total serum bilirubin levels over some time. Breastfeeding is stopped only when total serum bilirubin levels greater than 20mg\dl.

**Clinical examination of jaundice**

Originally described by Kramer[9], dermal staining of bilirubin may be used as a clinical guide to the level of jaundice. Dermal staining in new born progresses cephalon-caudal directions the new born should be examined in a good day light. The physician should pale the skin by digital pressure and underlying color of skin and subcutaneous tissue should be noted new born who are detected the yellow skin beyond thighs should have an urgent laboratory confirmation for bilirubin levels. Clinical assessment is unreliable if a new born has been receiving phototherapy and has dark skin.

The purpose of this study was to reevaluate the importance of clinical observation in the management of neonatal icterus. The specific objectives were to determine whether experienced observers agree in describing the extent of jaundice and to evaluate the reliability of visual assessment as an indication for the measurement serum bilirubin values.

**Advice for physiological jaundice**

The mother should be advised to breastfeed frequently. A parent should be allowed to know about the benign nature of jaundice. The newborn should be breastfeed with no top feeds, whatsoever.[10] Mother should be advised to bring their baby to the hospital on the time when she notices yellow discoloration of the skin. Any newborn discharged before 72hrs of life should be investigated again in the following 48hrs for adequate breastfeeding and progression of jaundice. Earlier or more frequent follow up should be given for those who have risk factors hyperbilirubinemia.

Very high levels of bilirubin, however, can damage a babies brain. The good news is that this condition is called kernicterus, is almost always diagnosed long before bilirubin levels become high enough to cause damage, and phototherapy treatment will usually make it go away.

- Doesn't want to feed at least 8-12 times every 24hrs
- Has pale skin
- Has jaundice gets worse(yellow color moving towards feet)

**Management of pathological jaundice**

Babies who are having yellow staining of skin beyond the legs should have a confirmatory measurements of serum bilirubin levels. Jaundice appearing within 24hrs should be prevented from hemolytic jaundice.[11]

Jaundice is the most common clinical sign in neonatal medicine, but only rarely is it associated with bilirubin neurotoxicity or the harbinger of significant under lying disease. Cases of kernicterus, which should be never event, are still occurring. Delays in the diagnosis of pathological causes of prolonged jaundice, such biliary atresia are still resulting in life long morbidity. These are salutary reminders that health care professionals should never take neonatal jaundice for granted.[12]

**Hemolytic jaundice**

Hemolytic jaundice, also known as prehepatic jaundice, is a type of jaundice arising from hemolysis or excessive destruction of red blood cells, when the byproduct bilirubin is not excreted by the hepatic cells quickly enough. Unless the patient is concurrently affected by hepatic dysfunctions or is experiencing hepatocellular damage, the liver does not contribute to this type of jaundice.[13]

Hemolysis is most important cause of severe hyperbilirubinemia during the early neonatal period. Without appropriate treatment, hyperbilirubinemia can develop into kernicterus particularly in preterm infants. The major cause of neonatal hemolytic jaundice are alloimmunization and congenital disorders of red blood cells. Such as hereditary spherocytosis and gluco-6-phosphate dehydrogenase deficiency.[14]

**RH hemolytic disease**

Rh-hemolytic disease, also known as rh incompatibility, is a condition that occurs when a women with rhesus-negative blood type is exposed to rhesus-positive blood cells, leading to the development of anti-D antibodies by the process called isoimmunization.[15] After this

sensitization, these maternal alloantibodies may persist for life and move freely across the placenta to the fetal circulation during subsequent pregnancies, where they lead to the destruction of fetal erythrocytes after forming antigen-antibody complexes with their surface D antigen. This result in alloimmune hemolytic anemia in the fetus, known as erythroblastosis fetalis. The severity of illness depends greatly on the number of immunoglobins, the gestational age, and the enzymatic activity of the fetus.[16]

**ABO incompatability**

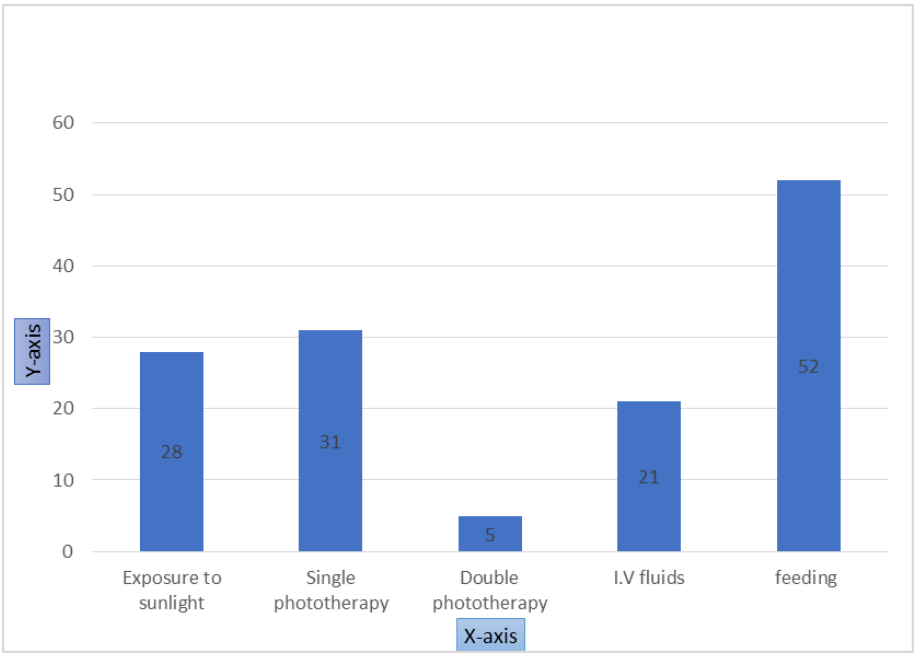
ABO incompatibility between O blood group mother and non-O blood group neonate is common. It rarely causes anemia and hyperbilirubinemia in neonate, requiring invasive management. Direct antiglobulin test may be positive in these cases with immunoglobulin (IG)-G antibody specificity.[17] There are few cases of hemolytic disease of newborn due to ABO incompatibility between mother and newborn with non-O blood group mother. After obtaining consent from the patient, we reported a case of incompatibility in a B blood group mother and A blood group neonates, and it was managed with phototherapy.[18]

## METHODS AND MATERIALS

We have done a case study on the "Effect of phototherapy in pediatrics jaundice" in Global hospital under the guidance of Dr.V.Vijay kumar MBBS, DCH and Aradhya hospital under the guidance of Dr.Veera babu MBBS, DCH and we also made a study regarding the Mata sisu meternity Government hospital (MCH) under the guidance of Dr.Veera babu MBBS, DCH. Under these studies we have covered the samples about52, of which males were 27 and females were 25. Among these 52 samples, double phototherapy was given for 5, and single phototherapy was given for 31, and I.V fluids was given for 21, and feeding was given for 52, and 28 samples were cured by sun exposure. In this sample size, 40 were C-section, 12 were normal delivery, and we didn't have seen reoccurred cases in these hospitals may be with the reason of proper breastfeeding, high birth weight, proper sun exposure according to bilirubin levels, phototherapy is preferred like single phototherapy or double phototherapy and sometimes sun exposure is preferred and this study also includes the side effects of phototherapy.

## STASTICAL DATA

**Graph About Treatment**




**Fg. 1.1: Treatment Showing Data.**

## CONCLUSION

Phototherapy will decreased bilirubin level in pediatric jaundice patients either in mild, moderate are severe conditions and id doesn't show any major side effects in neonates.

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