

A Study on Effect of Phototherapy on Reticulocyte and Total Count in Neonates with Neonatal Hyperbilirubinemia in A Tertiary Care Rural Hospital

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Abstract

Background and Objectives: Phototherapy is one of the most common and invasive methods in treatment of unconjugated hyperbilirubinemia of the neonate. Adverse effects of phototherapy include loose stools, skin rash and dehydration. There are very few studies which show the effect of phototherapy on total count and reticulocyte count. So, this study was done to show the effect of phototherapy on total count and reticulocyte count. **Subjects and Methods:** This is a prospective hospital based comparative study on 100 eligible neonates admitted in the Neonatal Intensive Care Unit receiving phototherapy at Adichunchanagiri Institute of Medical Sciences and research hospital, a rural tertiary care hospital, B.G.Nagara, Nagamangala Taluk, Karnataka from December 1st 2013- November 30th 2014. Two samples before and after phototherapy, were taken and analysis was done. The results were analysed statistically. **Results:** A total of 100 neonates were included in our study of which 55(55%) were males and 45(45%) were females. The mean(+/-SD) total count was 15463.5+/-163.6 before phototherapy and 15363+/-151.83 after phototherapy. The mean(+/-SD) reticulocyte count was 3.07+/-0.13% before phototherapy and 2.79+/-0.10% after phototherapy. **Conclusion:** In our study phototherapy has a significant effect on reticulocyte where as there was no significant effect on total count including neutrophils and leucocytes.

Keywords: Phototherapy; Unconjugated Hyperbilirubinemia; Platelet Count.

Introduction

Neonatal hyperbilirubinemia (NH) is commonest abnormal physical finding during the first week of life. Over two third of newborn babies develop clinical jaundice. The physical finding like yellowish discoloration of the skin and sclera in newborns is due to accumulation of unconjugated bilirubin. In most infants, unconjugated hyperbilirubinemia reflects a normal physiological phenomenon [1].

NH nearly affects 60% of term and 80% of preterm neonates during first week of life. 6.1% of well term newborn have a serum bilirubin over 12.9 mg%. Serum bilirubin over 15 mg% is found in 3% of normal term newborns. Nevertheless untreated, severe unconjugated hyperbilirubinemia is potentially

neurotoxic and conjugated hyperbilirubinemia is a harbinger of underlying serious illness [2].

NH is a reflection of liver's immature excretory pathway for bilirubin and is the most common reason for readmission of neonates in first week of life in current era of postnatal discharge from hospital [3]. Neonatal hyperbilirubinemia is a cause of concern for the parents as well as for the pediatricians [4].

Premature babies have much higher incidence of neonatal jaundice requiring therapeutic intervention than term neonates. Hyperbilirubinemia was found to be the most common morbidity 65% among 137 extremely low birth weight neonates born over a period of 7 years in AIIMS [5].

Elevated levels of unconjugated bilirubin can lead to bilirubin encephalopathy and subsequently kernicterus, with devastating, permanent neurodevelopment handicaps [6]. Conjugated hyperbilirubinemia indicates potentially serious hepatic disorders or systemic illnesses. Hence appropriate management of neonatal hyperbilirubinemia is of paramount importance.

Hyperbilirubinemia can be treated either by phototherapy or exchange transfusion or

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pharmacologic agents. Phototherapy has emerged as the most widely used form of the therapy for the treatment and prophylaxis of neonatal unconjugated hyperbilirubinemia. Phototherapy as a modality of treatment of jaundiced babies was introduced by Cremer et al⁷ in 1958 after her observation of rapid clearance of jaundice in neonates exposed to sunlight in the nursery. In nearly all neonates, phototherapy reduces or blunts the rise of maturity, presence or absence of hemolysis, or degree of skin pigmentation [8]. Phototherapy is an effective and relatively safe method for reducing indirect bilirubin levels, particularly when initiated before serum bilirubin increases to levels associated with kernicterus [9].

As any treatment has its side effects, phototherapy also have its adverse effects like hyperthermia, feed intolerance, loose stools, skin rashes, bronze baby syndrome, retinal changes, dehydration, hypocalcemia, redistribution of blood flow and genotoxicity [4,5,10].

Unlike other side effects, a very few studies are currently available that depicts the effect of phototherapy on reticulocyte and Total count with controversial results. Hence the present study is undertaken to find out if phototherapy has any significant effect on the reticulocyte and total count.

Materials and Methods

We conducted a prospective hospital based comparative study on 100 eligible neonates admitted in the Neonatal Intensive Care Unit receiving phototherapy at Adichunchanagiri Institute of Medical Sciences and research hospital, a rural tertiary care hospital, B.G. Nagara, Nagamangala Taluk, Karnataka from December 1st 2013- November 30th 2014. The study was approved by the Research Ethics Committee of AIMS, Mandya. A predesigned proforma has aided the enrollment of newborns into the study.

The Term and Preterm Neonates receiving phototherapy for unconjugated hyperbilirubinemia without any comorbidities like Birth asphyxia, septicemia, renal failure, etc were included in the study. Neonates with co-morbidities like Birth

asphyxia, Septicaemia, Renal failure were excluded from the study.

Venous blood samples were collected from the neonates included in the study and sent for total bilirubin, direct bilirubin, reticulocyte and total count and blood group. Total and direct bilirubin is measured by Diazo method (Diazotized sulfanilic test). Total count was measured by auto analyzer (Sis II). Blood group of newborn analyzed by antisera method.

Reticulocyte and total count was checked at 0 hours and at discontinuation of phototherapy (second sample). The first sample was considered as control. Comparative study was made between these groups to determine the changes in reticulocyte and total counts. Proportions will be compared using chi-square test. All data of various groups will be tabulated and statistically analyzed using suitable statistical tests (Student's t test). P value less than 0.05 was considered to be moderately significant and p value < 0.01 as strongly significant.

Results

A total of 100 neonates were included in our study of which 55(55%) were males and 45(45%) were females. Twenty eight neonates were having weight < 2.5kg of which 12(21.8%) were males and 16(35.6%) were females. The mean birth weight in our study group was 2.83 +/- 0.3kg. 17(17%) neonates were preterm and 83(83%) neonates were term. Of the 17 preterm (14.5%) were males and nine (20%) were females. Mean gestational age was 38.49 +/- 1.5 weeks. Sixty five (65%) of the neonates were born to primiparous mothers and thirty five (35%) are born to multipara.

The mean (+/-SD) reticulocyte count was 3.07 +/- 0.13% before phototherapy and 2.79 +/- 0.10% after phototherapy. There was a decline in the mean reticulocyte count after phototherapy and it was statistically significant (p < 0.001) Table 1. The mean (+/-SD) Total count was 15463.5 +/- 163.6 before phototherapy and 15363 +/- 151.83 after phototherapy. There was no significant effect of phototherapy on total count (p = 0.20) Table 1 including neutrophils (p = 0.51) and lymphocytes (p = 0.057).

Table 1: Mean reticulocyte and total count (neutrophils and lymphocytes) before and after phototherapy

Mean +/- SD	Before Phototherapy	After Phototherapy	P value
Reticulocyte count	3.07 +/- 0.13%	2.79 +/- 0.10%	P < 0.001 t = 7.85
Total count	15463.5 +/- 163.6	15363 +/- 151.83	P = 0.20 t = 2.37
Neutrophils	55.22 +/- 0.33	55.08 +/- 0.32	P = 0.51 t = 0.661
Lymphocytes	41.24 +/- 0.31	40.76 +/- 0.34	P = 0.057 T = 1.92

In our study there was a significant effect of phototherapy on reticulocyte count where as there was no significant effect of phototherapy on Total count including neutrophils and lymphocytes.

Discussion

Our study which was conducted on 100 neonates admitted for phototherapy showed that there was significant effect of phototherapy on Retic count. There was a decrease in mean retic count after phototherapy which was statistically significant ($p < 0.001$).

Ahmadpour et al [11] (2013) in his study found that there was no significant effect of phototherapy on Retic count which was in contrast to our study which showed that phototherapy has a significant effect on retic count.

Coming to total count, in our study there was a decrease in mean Total count after phototherapy but was not statistically significant ($p = 0.20$). So there was no significant effect of phototherapy on total count including neutrophils and lymphocytes.

Ahmadpouret al [11] (2013) found that there was no significant difference in change in neutrophils ($p = 0.112$) and lymphocytes ($p = 0.178$) after phototherapy and concluded that phototherapy has no significant effect on WBC. This study was in relation to our study which showed no significant change in Total count including neutrophils ($p = 0.510$) and lymphocytes ($p = 0.057$).

Sakha K et al [12] (2006), Jahanshahifard S et al [13] (2012) in there studies showed that phototherapy has an effect on WBC count including neutrophils. Both these studies where in contrast to our study which showed that phototherapy has no significant effect on WBC count including neutrophils and lymphocytes.

Conclusion

Our study concludes that phototherapy has a significant effect on reticulocyte count but has no significant effect on total count including neutrophils and lymphocytes.

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