SJIF Impact Factor: 5.464

WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

ISSN: 2457-0400
Volume: 7.
Issue: 6
Page N. 90-93
Year: 2023

Original Article www.wjahr.com

THE RATE 0F EXCHANGE TRANSFUSION PRE AND POST USE OF INTENSIVE PHOTOTHERAPY

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Received date: 11 April 2023 **Revised date:** 01 May 2023 **Accepted date:** 21 May 2023

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ABSTRACT

Introduction: Hyperbilirubinemia is a prevalent and generally harmless condition in newborns. Around 60% of full-term infants and 80% of preterm infants experience jaundice in their first week of life. However, hyperbilirubinemia can cause encephalopathy at any point during the neonatal period, with lethargy, poor feeding, and loss of the Moro reflex being common early signs. Objectives: This study aims to evaluate the efficacy of intensive phototherapy in reducing the need for exchange transfusion at AL-Zahraa Teaching Hospital in AL-Najaf city. **Method:** This retrospective study analyzed 6528 full-term infants with indirect hyperbilirubinemia at Al-Zahraa Teaching Hospital between 2008 and 2011. Exclusions comprised premature newborns, direct hyperbilirubinemia cases, critically ill newborns, and others. The research compared the need for ECT between two periods: 2008-2009 (no IPT) and 2010-2011 (IPT as an alternative). The American Academy of Pediatrics (AAP) guidelines were followed for managing hyperbilirubinemia in the neonatal care unit. **Results:** The study of 6528 neonates with neonatal jaundice revealed a significant decrease in exchange transfusion (ECT) rates from 668 cases (2008-2009) to 75 cases (2010-2011) following the implementation of intensive phototherapy (IPT), resulting in a 90% reduction. Males were more affected than females. The main cause of hyperbilirubinemia necessitating ECT was ABO incompatibility, followed by Rh incompatibility and other causes, with similar patterns observed in both study periods. **Conclusion:** In conclusion, extensive phototherapy is more effective in reducing excessive bilirubin levels in all types of newborn jaundice, particularly in cases of Rh and ABO incompatibility. Consequently, highly intensive phototherapy for neonatal jaundice lowered the exchange transfusion rate and associated complications.

KEYWORDS: Exchange, Transfusion Pre, Post, Intensive Phototherapy.

INTRODUCTION

Jaundice is the term used to describe the skin's yellow colour as a result of bilirubin being deposited in dermal and subcutaneous tissue.[1-3] Before being expelled into the bile and eliminated from the body via the stomach, bilirubin is processed in the liver and conjugated to glucuronic acid by the enzyme UGT1A1.[4,5] Jaundice and hyperbilirubinemia may result from ineffective elimination systems or from excessive endogenous bilirubin synthesis. Neonatal hyperbilirubinemia is widespread; during the first week of life, it affects 60% of term newborns and 80% of preterm infants.[1] Lethargy, poor eating, and loss of the Moro reflex are just a few of the signs that may result in encephalopathy during the newborn era. Exposure to high-intensity light in the visible spectrum, especially in the blue region (420-470 nm), may decrease clinical jaundice and indirect hyperbilirubinemia.[1] Jaundice in newborns may be brought on by a pathological disease, such as isoimmune hemolysis or a deficit in the RBC enzyme, although this is less common than it formerly was.[4,6] Physiologic jaundice of the infant is the name given to this non-pathologic jaundice. However, in rare instances, medication is necessary to prevent acute and chronic bilirubin encephalopathy (kernicterus), even if bilirubin concentrations in most newborns do not escalate to the point where it necessitates intervention.[2,5,7,8] At Rochford Hospital in Essex, England, a ward sister found that newborns exposed to sunlight and fresh air had reduced jaundice, which led to the development of phototherapy.[9] Unconjugated bilirubin is converted by phototherapy into water-soluble photo-products that may

be eliminated via the gut and urine.[6,10] The three primary mechanisms of phototherapy are as follows: (a) configurational isomerization, in which bilirubin's Z-isomer is converted into yellow E-isomers.[6,11,12] (b) structural isomerization, in which bilirubin is converted into lumirubin, which is excreted quickly; and (c) photo-oxidation, which results in colourless water-soluble photo-products excreted in urine.[6,11,12] In AL-Zahraa Teaching Hospital in AL-Najaf City, the objective is to evaluate the efficiency of intense phototherapy in lowering the demand for exchange transfusions.

METHOD

Between January 1st, 2008, and November 30th, 2011, 6528 term neonates with indirect hyperbilirubinemia close to the exchange level were included in this retrospective observational research at the al-Zahraa Teaching Hospital in Al-Najaf City. In order to assess the reduction in exchange transfusion (ECT) rates brought on by intense phototherapy (IPT), the research compared two time periods: January 1st, 2010, to November 31st, 2011, when CPT was used, and January 1st, 2008, to November 31st, 2009, when IPT was used. Charts suggested by the American Academy of Paediatrics Subcommittee on Hyperbilirubinemia were used to plot total serum bilirubin (TSB) levels and determine if phototherapy or exchange transfusion were necessary. For the duration of the trial, phototherapy at the NCU was started and stopped in accordance with standard AAP recommendations. Premature infants (age 37 weeks), instances of direct hyperbilirubinemia, babies in critical condition, and neonates exhibiting early indications of kernicterus were excluded from the research. Infants with early exchange indications (cord haemoglobin 10 g/dL and bilirubin 5 mg/dL, indicating severe hemolysis, and reticulocyte counts > 15%) were also disqualified. The main intervention compared for the need for ECT during the two periods was IPT. The Cradle 360 device from Mediprema was used for the intense 360 phototherapy. It had a chamber with 16 blue TL (TL 20 W/52) fluorescent bulbs positioned cylindrically within 20 cm of the newborn. The infant was positioned in the chamber's centre on a gauze hammock that was well lit from all sides. The only things used on infants were diapers and eye pads. Except for when blood was drawn for testing and during eating and nursing, phototherapy was provided constantly. All newborns got phototherapy as soon as they were admitted, and six hours after the start of the treatment, TSB was assessed. Urgent ECT was performed on infants with unresponsive hyperbilirubinemia utilising fresh blood, twice the baby's blood volume (2x85ml/kg), and fresh blood type. Utilising statistical analysis techniques for data administration and analysis, graphics were produced using Microsoft Excel 2007. Categorical data were presented as percentage summaries, and the chi-square test was used to compare categorical data. Any p-value that was 0.05 or below was regarded as significant.

RESULTS

The result of this study consist of 6528 neonates with neonatal jaundice recorded during the years from the 1st of January 2008 to 31st of November of 2011, from those neonates only 668 need exchange transfusion from the 1st of January 2008 to the 31st of November 2009 while only 75 need exchange transfusion from the 1st of January 2010 to the 31st November 2011, with highly significant difference in the rate of exchange transfusion between the two periods. so the reduction rate of exchange transfusion due to IPT during the 1st of January 2010 to the 31st of November 2011 is 90%.

Table (1) Comparison between the two periods regarding need for exchange transfusion.

	Not need exchange	Need exchange	Total patient with jaundice	P value
2008 and 2009	2225(76.9%)	668(23.1%)	2893	<0.001
2010 and 2011	3560(97.9%)	75(2.1%)	3635	

Table (2) Reduction rate of exchange transfusion due to IPT during 2010 and 2011.

	At level of exchange treated with IP	Patients need exchange	Reduction rate
2010 and 2011	784	75	90%

Table (3) Sex distribution of the studied sample.

	Male	Female	P value
2008 and 2009	472(70.6%)	196(29.4%)	0.999
2010 and 2011	53(70.7%)	22(29.3%)	

In table 3 there were no significant difference in sex of patients during the two periods.

Table (4) Causes of jaundice among patients need exchange.

	ABO	Rh	Others	P value
2008 and 2009	468(70%)	126(18.9%)	74(11.1%)	0.098
2010 and 2011	46(61.3%)	22(29.3%)	7(9.4%)	

In table 4 there were no significant difference between the two periods regarding cause of jaundice which need exchange transfusion.

DISCUSSION

While jaundice in newborns is common and typically benign, extremely high TSB levels can damage the central nervous system of the newborn. Phototherapy and/or ECT are the primary treatment options for jaundiced newborns at risk of reaching or who have already attained dangerously high levels. Phototherapy is both safer and less expensive than ECT, and it requires a less complex level of care and specialized expertise. The implementation of IPT has reduced the need for ECT in term infants with hemolytic and non-hemolytic jaundice. Out of the 6528 neonates with NNJ recorded between January 1st, 2008 and November 31st, 2011, 668 required ECT during the period between January 1st, 2008 and November 31st, 2009, while only 75 required ECT between January 1st, 2010 and November 31st, 2011 (Table 1). This significant difference in ECT rates between the two periods can be attributed to the use of IPT, which effectively lowered the ECT rate. Among the 784 patients who received IPT, only 75 needed ECT, resulting in a 90% reduction rate during the period from January 1st, 2010 to November 31st, 2011 (Table 2). High-intensity phototherapy has proven effective in rapidly decreasing TSB levels and reducing the need for ECT. The efficacy of IPT may be due to its higher photolight intensity, irradiance, and a shorter distance (15-20 cm) between the infant and the light source. A similar study conducted in Egypt on neonates with severe and extreme neonatal unconjugated hyperbilirubinemia also demonstrated the effectiveness of IPT in decreasing ECT rates.[7] The study sample's sex distribution showed that more males than females underwent ECT during both study periods (Table 3). Various factors, such as greater parental attention given to males and a higher incidence of G6PD deficiency, have been proposed to explain the observed sex differences in NNJ.[3,13] Regarding the causes of NNJ among patients who required ECT, ABO incompatibility was found to be the most common cause, followed by Rh incompatibility and other causes (Table 4). This finding is consistent with other studies that have identified ABO incompatibility as the primary cause of hyperbilirubinemia necessitating ECT.

CONCLUSION

The use of IPT reducing needs for exchange transfusion for those with TSB near level of ECT. Finally, we find that the intensive phototherapy is more effective in decrease the elevated bilirubin level in all cases of neonatal jaundice especially in Rh incompatibility and ABO incompatibility. So exchange transfusion rate was much decreased when highly intensive phototherapy was started in the management of neonatal jaundice and the complications of ECT were decreased also.

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