Analysis of Neonatal Jaundice Requiring Exchange Transfusion

Satyasree Devineni[1]

ABSTRACT

Introduction: Neonatal jaundice, a physiologic condition reflecting the interplay between developmentally modulated changes in bilirubin production and metabolism, affects virtually all newborns. The aim of the study is to determine the etiology of hyperbilirubinemia requiring exchange transfusion and to determine the efficacy of exchange transfusion in our set up.

Material and methods: The present prospective study was conducted in a private recognized medical college in the department of pediatrics, Andhra Pradesh during the period September 2009-september2011. The study group consists of 150 neonates who presented with history of jaundice, among them 18 cases required exchange transfusion for treating the hyperbilirubinemia. Pre exchange samples were drawn from peripheral vein or femoral vein, Post Exchange samples were collected from umbilical vein. The samples were analysed for CBP, retic count, coomb's test, pre and post exchange serum bilirubin and sepsis (Blood or Urine for culture and sensitivity). Cases with predominant conjugated bilirubin were excluded. The study group included both term and preterm babies with neonatal jaundice. All the data obtained was arranged in a tabulated form and analysed using SPSS software.

Results: There were 33.33% of newborn who were delivered by SVD, 55.5% by LSCS and 11.11% by forceps. The neonates were less than 1 day to 8 days old. There were 61.1% males and 38.8% females who had neonatal jaundice. There were 27.7% of ET cases were done between 24-72 HOL, 66.6% done between 3-7 DOL. The pre ET values range in ABO incompatability is 14-20 mg/dl and in RH HDN is 20-28 mg/dl Percentage of reduction in indirect bilirubin after ET in ABO incompatability is ranging from 57-60% and in RH HDN is 50%.

Conclusion: Analysis shows that the common etiological factors requiring ET in decreasing order of frequency are ABO incompatibility, prematurity, RH - HDN, and Sepsis. The efficacy of the ET procedure is 50% well comparable to other studies. Only 1 case needed second ET procedure to treat the hyperbilirubinemia. There was no mortality or morbidity attributed to the ET procedure in our hospital.

Keywords: Etiology, Hyperbilirubinemia, Jaundice, Transfusion

INTRODUCTION

Jaundice is the visible manifestation of elevated serum bilirubin as evident on the skin and sclera. In adults, it is manifested at 2mg/dl[1,2] while in neonates, only at 5-7mg/dl. Neonatal jaundice, a physiologic condition reflecting the interplay between developmentally modulated changes in bilirubin production and metabolism, affects virtually all newborns. Often it is entirely benign resolving by the end of the first week of life without treatment or sequelae. But in some neonates, hyperbilirubinemia can pose a neurotoxic risk especially in presence of aggravating conditions such as a diminished albumin binding capacity and/or affinity, acidosis, displacing drugs and prematurity.[3] Over years, incidence has increased to 10-14%[3], probably by increased suspicion and detection. But now many hospitals practice early discharge of mothers and babies which has increased chances of missing hyperbilirubinemia[4-8] as physical examination is not a reliable measure of serum bilirubin. Camilla R[1] in her review article quoted that prevalence of neonatal jaundice ranges between 25 and 50% of all term newborns with higher percentage in premature babies; 6.1% of term babies have significant hyperbilirubinemia. Neonatal jaundice is often physiologic, benign and self-limiting, but danger lies in high levels capable of producing neurological injury in the form of bilirubin encephalopathy, adding on to mortality and morbidity in developing countries.[9] The aim of the study is to determine the etiology of hyperbilirubinemia requiring exchange transfusion and to determine the efficacy of exchange transfusion in our set up.

MATERIAL AND METHODS

The present prospective study was conducted in a private recognized medical college in the department of pediatrics, Andhra Pradesh during the period September 2009 - September 2011. The study group consists of 150 neonates who presented with history of jaundice, among them 18 cases required exchange transfusion for treating the hyperbilirubinemia. Careful and detailed history and physical examination was carried out and routine investigations done according to protocol in the proforma in the study. All the patients were informed about the study and a written consent was obtained from all. The study was approved by the institute's ethical board. Pre exchange samples were drawn from peripheral vein or femoral vein, Post Exchange samples were collected from umbilical vein. The samples were analysed for CBP, retic count, coomb's test, pre and post exchange serum bilirubin and sepsis (Blood or Urine for culture and sensitivity). Cases with predominant conjugated bilirubin were excluded. The study group included both term and preterm babies with neonatal jaundice.

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International Journal of Contemporary Medical Research
Volume 4 | Issue 8 | August 2017 | ICV: 77.83 | ISSN (Online): 2393-915X; (Print): 2454-7379

Procedure: The infant was restrained and umbilicus is prepared by cleaning with betadine for 3 minutes followed spirit for 90 sec. The area is isolated with sterile towels. Heparin is added to normal saline in 1: 10 dilution placed in two kidney bowls. All the syringes, stopcocks and umbilical catheter area flushed with this heparinised normal saline.

The umbilical cord is cut and above the stump, the umbilical vein identified at 12'clock position. The umbilical catheter is passed into the vein by applying traction to the umbilical cord with a mouse toothed forceps. Catheter must be filled with heparinised saline before cannulating the umbilical vessel. Supra umbilical cut down was done in two cases where umbilical stump was not available for catherization. Infants CVP was measured by holding the venous catheter upright at right angle to the infants body. The height of the column is measured from the level of the heart. If the pressure is between 3-10 cm the catheter was connected to a three way stopcock and the stopcock to the banked blood and disposable unit.

Initial aliquot of 5 ml drawn sent to lab for analysis of serum bilirubin, Hb% and blood glucose levels. Modified diamond, single site push and pull method was used. The aliquots used vary with the weight of the infant. A rate of 5 ml/kg/min was used. Equal amount of aliquot blood is transfused into the infant slowly maintaining the pulling to pushing ratio of 1:4. The cycle was repeated until the whole blood is transfused. During the procedure the banked blood was agitated every 10 min. to prevent RBC from settling. Assistant physician monitored the heart rate, and keeping an accurate record of the volumes of blood exchanged in and out of the patient throughout the procedure which lasted from 45 min. to 90 minutes. The last aliquot withdrawn was sent for analysis of S.Bil, glucose, and hemotocrit unit. The umbilical catheter is gently removed and pressure bandage applied.

STATISTICAL ANALYSIS

All the data obtained was arranged in a tabulated form and analysed to apply Chi square test using SPSS software**.**

RESULTS

In our study out of 150 nenates, 18 required exchange transfusion. There were 33.33% of newborn who were delivered by SVD, 55.5% by LSCS and 11.11% by forceps. The neonates were less than 1 day to 8 days old. There were 61.1% males and 38.8% females who had neonatal jaundice. Figure-1 shows weight of babies at birth. Out of total, 27.7% were term babies, 44.4% were LBW, and 22.22% were VLBW. There were 5.5% babies who were less than 1 kg at birth. There was no significant difference in the weight of the subjects (p value>0.05). Figure-2 shows age at jaundice. Icterus was noticed in 33.33% of babies within 24 HOL, 50% in 48 HOL, 16.6% after 48 HOL. This shows that most of the babies developed jaundice within 24HOL. Figure-3 shows the etiology of neonatal jaundice. In this study of 18 cases, ABO incompatability was the most common cause of which ET was done to treat the hyperbilirubinemia. In 7.3% jaundice developed due to sepsis. There were 45.3%

cases of physiological jaundice. In 8 cases the cause of jaundice was still not determined. There was a significant difference in the etiology of neonatal jaundice with majority of cases of physiological jaundice. Table 1 shows the age of the neonates at which exchange transfusion was done. There were 27.7% of ET cases were done between 24-72 HOL, 66.6% done between 3-7 DOL. Though in 50% cases icterus was noticed with in 24-48 HOL, time taken for the hyperbilirubinemia to reach levels requiring ET occurred at 72 hours to 7 days in 66.6% cases. Table 2 shows the efficacy of exchange transfusion. The pre ET values range in ABO incompatability is 14-20 mg/dl and in RH HDN is 20-28 mg/dl Percentage of reduction in indirect bilirubin after ET in ABO incompatability is ranging from 57-60% and in RH
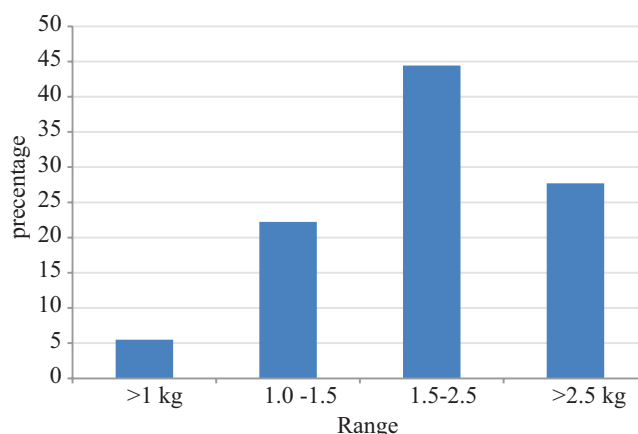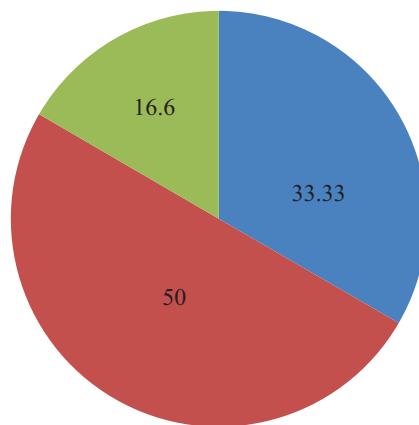

Figure-1: Birth weight of neonates

Figure-2: Age of the neonates at which jaundice developed
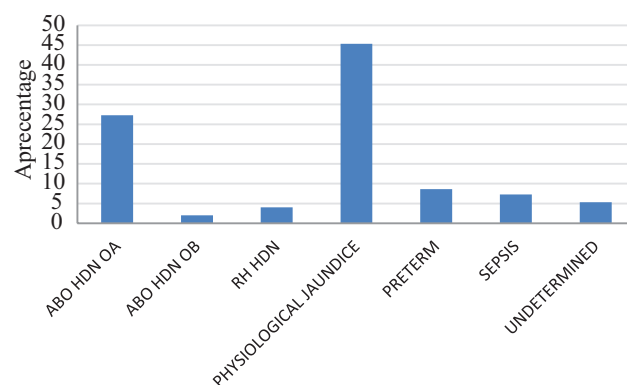

Figure-3: Etiology of neonatal jaundice

International Journal of Contemporary Medical Research
ISSN (Online): 2393-915X; (Print): 2454-7379 | ICV: 77.83 | Volume 4 | Issue 8 | August 2017

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Days	<24 hrs	24-72	72-7 Days	Total
No	1	5	12	18
%	5.5	27.7	66.6	100
Table-1: Age of the neonates at exchange transfusion				

Cause of jaundice	No of cases	Range of pre ET Unconjugated Bilirubin		Range of post ET Unconjugated Bilirubin		No of ET Required		% of Reduction In Indirect Bilirubin
		Min	Max	Min	Max	1	2	
ABO	14	14	20	8	12	13	1	57 -60%
RH HDN	4	20	28	10	14	4	-	50%
Table-2: Showing efficacy of exchange transfusion								

HDN is 50%.,There was significant reduction in bilirubin percentage in both cases of ABO incompatibility and RH incompatibility.

DISCUSSION

In our study, 44.44% babies were 1.5-2.5kg which is risk group for increased incidence of jaundice. In a study conducted by Arif[10] in 414 neonates in Jinnah Postgraduate Medical Centre, Karachi, 42.5% of the jaundiced babies were low birth weight. Gale R[11] and others in a study in Jerusalem among 10,122 babies found that a high bilirubin level was significantly associated with lower birth weight. In babies above 2.5kg, prevalence was 8.94% and in low birth weight babies it was 16.97%. Lange AP[51] and colleagues in their study among 739 infants found that neonatal jaundice was significantly associated with a lower birth weight. In this study, 50% of cases had onset of jaundice within 48 hours. This gives an important clue to the etiology that the cause of hyperbilirubinemia is mainly pathological and not just physiological. Gale R[11] and colleagues in his study on the epidemiology of neonatal jaundice among 10,122 infants in Jerusalem found that a high bilirubin level was significantly associated with first delivery and lower birth order, with 42.21% occurring in babies of first order. Meng KH[12] and colleagues in a case control study among 83 jaundiced infants and 332 normal infants in Korea found that neonatal hyperbilirubinemia was significantly associated with early birth order. But this association was lost when the method of delivery was controlled. Gale R[11] and co-workers in their study in 10,122 babies found that a high bilirubin level was significantly associated with blood group O in the mother in 32.8% of cases of hyperbilirubinemia, mostly due to ABO incompatibility. A study from Indian in 1985,[13] analysing 100 neonates who underwent exchange transfusion for neonatal jaundice showed that the RH HDN, ABO HDN, undermined and sepsis were the common cause. Later studies in 1996 showed Idiopathic as the common cause followed by Sepsis. The frequency of RH negative blood group is 5% in India population as against 15% in European. The incidence of RH HDN as the most common cause of neonatal jaundice is decreasing because of prophylactic antenatal immunisation with anti D globulin in mother. Double volume exchange done in all cases of hyperbilirubinemia resulted in approximate-mate fall of bilirubin by 50% which compares well with documented literature.[13,14] Only 8% cases required repeat exchange transfusion compared to 6.6% in the study.[13] This is possibly due to prophylactic use of phototherapy both pre and post exchange, which has decreased the need for multiple ET. Of the various complications encountered direct procedural mortality was 2% in study.[13] There was no direct mortality due to the procedure in this study group. A study conducted by Nabaneeta Dash et al[15] to evaluate the efficacy of pre exchange transfusion albumin amongst neonates with hyperbilirubinemia concluded that transfusion with 1 g/kg of 20% albumin prior to exchange transfusion does not provide superior results compared to equivolume 0.9% saline in reducing the duration or amount of post- exchange transfusion phototherapy. In a case report by Jeffrey et ay, phototherapy was used effectively in management of neonatal jaundice.[16] According to Joshua Aderinsola Owa et al, phototherapy provides better and effective results compared to exchange transfusion though it is widely followed.[17] A long term follow up as regards transmission of infection -malaria, hepatitis and neurological status, BERA and development of extrahepatic portal hypertension needs to be undertaken in these neonates.

CONCLUSION

Analysis shows that the common etiological factors requiring ET in decreasing order of frequency are ABO incompatibility, prematurity, RH - HDN, and Sepsis. The efficacy of the ET procedure is 50% well comparable to other studies. Only 1 case needed second ET procedure to treat the hyperbilirubinemia, There was no mortality or morbidity attributed to the ET procedure in our hospital.

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International Journal of Contemporary Medical Research
ISSN (Online): 2393-915X; (Print): 2454-7379 | ICV: 77.83 | Volume 4 | Issue 8 | August 2017

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