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USEFULNESS OF CORD BLOOD ANALYSIS IN PREDICTING HYPERBILIRUBINEMIA IN BABIES AT RISK OF DEVELOPING ABO INCOMPATIBILITY

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ABSTRACT Cord blood analysis is useful for predicting pathological hyperbilirubinemia in babies at risk of ABO incompatibility.In cord blood analysis cord bilirubin is the best predictor for the development of hyperbilirubinemia.Neonates with cord bilirubin values > 3 mg/dL are at higher risk for developing pathological hyperbilirubinemia. A lower cord blood hemoglobin level is associated with a higher 4th day bilirubin level. A cord hemoglobin level below 14.55 g/dL was associated with a higher risk of babies to develop pathological hyperbilirubinemia. Significant reticulocytosis in cord blood was not seen in babies with the risk of ABO incompatibility. Though Direct coomb's test was positive only 15 % of babies with pathological hyperbilirubinemia, all babies with positive direct coomb's test developed pathological hyperbilirubinemia. All children who had positive DIRECT COOMBS TEST developed pathological hyperbilirubinemia(P-VALUE=0.008).

KEYWORDS : Newborn,Jaundice,Hyperbilirubinemia.

INTRODUCTION

Jaundice is the commonest abnormal finding in the first week of life. The clinical jaundice will manifest in neonates at a serum bilirubin level above 5.0 to 7.0 mg/dL (86 – 119 micromoles/L) . Chemical hyperbilirubinemia, which is defined as serum total bilirubin level of 2.0 mg/dL (34micromoles/L) or more, is virtually universal in newborns during first week of life . Between 25 – 50 % of all term newborns and a higher percentage of premature infants develop clinical jaundice. Also 6.1 % of well term newborns have a maximal serum bilirubin level > 12.9mg/dL. A serum bilirubin level of > 15mg/dL is found in 3 % of normal term babies . As the intensity of jaundice increases, there is cephalocaudal progression of yellow discolouration of skin. Hyperbilirubinemia can cause bilirubin encephalopathy and severe sequelae. So it is imperative that pathological hyperbilirubinemia is picked up early and vigorous treatment is started. When the newborn stays at the hospital for a 72-hour post-delivery period, it is possible to observe the peaking of the physiological jaundice, thus allowing medical intervention, if necessary. However, in cases of early discharge from the hospital, the newborns may be subjected to re-admission for phototherapy treatment because of high levels of unconjugated bilirubin. Such readmissions, besides involving extra expenses for both the family and the institution and also exposing a probably healthy newborn to the hospital environment, brings emotional problems and risks to breast-feeding, and is one of the causes of early weaning . In the Institute of Obstetrics and Gynaecology there are 1800 deliveries conducted every month and most babies were discharged in 48 to 72 hours unless they are delivered by caesarean section or there are some maternal or newborn complications. 5-10% babies delivered are admitted in the newborn unit for neonatal hyperbilirubinemia, out of which the major number of cases are due to ABO incompatibility. So it is worth screening these babies who are at risk of developing ABO incompatibility.

MATERIAL AND METHODS

Babies born of caesarean section were included in the study because these babies were usually kept in the hospital for a period of 10 days and they can be followed up during that period for the presence of jaundice. OUTCOME MEASURES: Serum bilirubin taken in the 4th day is taken as the outcome measure. Criteria for pathological jaundice- 1. as Jaundice within 24hours of life. 2. Jaundice persisting >1 week.3. Total serum bilirubin more than the 95th percentile for the age in hours.4. Direct bilirubin >1.5 mg/dl. 5. Total serum bilirubin increasing more than 5 mg/dl/day or 0.5 mg/dl/hour. In our study pathological hyperbilirubinemia is defined as a serum 47 total bilirubin level >15 mg/dL on 4th day of life or any total serum bilirubin more than the 95th percentile for the age in hours taken.

RESULTS

A total of 136 babies with the risk of ABO incompatibility were included in the study. 73% (99) of the babies developed clinical jaundice and nearly 10% (13) of cases developed pathological jaundice. The data obtained was analysed as follows: 1. features of study population (sex, birth weight, blood group distribution) 2. Correlation of cord blood bilirubin with peak bilirubin values. 3. Receiver operated characteristic curve for cord bilirubin and cut off value for predicting pathological hyperbilirubinemia. 4. Correlation of cord blood hemoglobin with peak bilirubin values. 5. Receiver operated characteristic curve for cord hemoglobin and cut off value for predicting pathological hyperbilirubinemia. 6. Correlation of cord blood reticulocyte count with peak bilirubin values. Cut off value of cord blood reticulocyte count for predicting pathological hyperbilirubinemia. 8. Correlation between direct coombs' test and pathological hyperbilirubinemia.

DISCUSSION

The major cause of pathological hyperbilirubinemia is ABO incompatibility . This study was conducted to find out whether routine cord blood analysis can be useful in predicting pathological hyperbilirubinemia in newborns at risk of pathological hyperbilirubinemia. The aim was to find out whether cord blood bilirubin, hemoglobin and reticulocyte count values correlated with the peak bilirubin values. If these values could predict the development of pathological hyperbilirubinemia we could decide on the early discharge of these at risk babies. This study included 136 babies who were at risk of ABO incompatibility which include babies with either A or B blood group born to O positive mothers. All babies were term (>37 weeks) and appropriate for gestational age (2.5 – 4 kg). Those babies who had other potential causes for developing jaundice like birth asphyxia, sepsis, birth injuries, mother with diabetes, PIH were excluded from the study. Preterm babies were excluded from the study because the serum bilirubin levels and the peak level going for kernicterus were highly variable. The aim was to find out cord blood analysis is useful in predicting pathological hyperbilirubinemia. Factors in the cord blood that we studied included cord bilirubin, hemoglobin, reticulocyte count and direct coomb's test. Higher cord 66 bilirubin levels, lower cord

hemoglobin, higher reticulocyte count and a positive direct coomb's test were associated with a higher risk of the babies to develop pathological hyperbilirubinemia. In our study we tried to determine the correlation between cord blood bilirubin, hemoglobin, reticulocyte count and direct coomb's test positivity with the development of pathological hyperbilirubinemia. Final outcome measurement is pathological bilirubinaemia which is defined in our study as a 4th day bilirubin value above 15 mg/dL or a serum bilirubin level more than the 95th percentile for the age in hours. 13 out of 136 babies studied in our study developed pathological hyperbilirubinemia in our study (9.56 %). Bilirubin peaking was mostly noted in the 3rd and 4th day. Out of the 13 babies who had pathological hyperbilirubinemia 12 required phototherapy (phototherapy started on 3rd or 4th day) and 1 required exchange transfusion (on 3rd day of life). The baby who required exchange transfusion had a cord blood bilirubin of 4.2mg/dL, cord blood hemoglobin 13.2mg/dL. But her reticulocyte count was 1 % and direct coomb's test was negative. Cord bilirubin values in the study population were in the range of < 0.001). So cord bilirubin can effectively predict the risk of pathological hyperbilirubinemia. This results are similar to that of studies done by Whyte J, Graham H 77Chen JY, Ling UP et al 74Procianoy RS et al. 76 . Lower cord hemoglobin is associated with higher risk of hyperbilirubinemia. The strength of the association is weak – Pearson's correlation r= - 0.139 (p-value=0.11). The risk of hyperbilirubinemia increases with an increase in reticulocyte count p-value = 0.002. The strength of the correlation was weak Spearman's correlation r= 0.364 (p value-PREDICTIVE VALUE OF CORD BLOOD TESTS A cord bilirubin value of > 3mg/dL can be used as a cut off for predicting pathological hyperbilirubinemia with a specificity of 92.3%, sensitivity of 97.5%, positive predictive value of 84.6 % and negative predictive value of 98.4%. A hemoglobin value below 14.55 g/dL can be used as a good predictor from this curve with a sensitivity of 53.8 %, specificity of 70.7 %, positive predictive value of 15.9 % and negative predictive value of 93.4 %. A reticulocyte count >2% could predict the risk of pathological hyperbilirubinemia with a sensitivity of 46 % and specificity of 67%. Direct coomb's test is positive in 15.4 % of babies who developed pathological hyperbilirubinemia. All children who had positive DIRECT COOMBS TEST developed pathological hyperbilirubinemia. (P-value = 0.008).

CONCLUSION

Cord blood analysis is useful for predicting pathological hyperbilirubinemia in babies at risk of ABO incompatibility.In cord blood analysis cord bilirubin is the best predictor for the development of hyperbilirubinemia.Neonates with cord bilirubin values > 3 mg/dL are at higher risk for developing pathological hyperbilirubinemia. A lower cord blood hemoglobin level is associated with a higher 4th day bilirubin level. A cord hemoglobin level below 14.55 g/dL was associated with a higher risk of babies to develop pathological hyperbilirubinemia. Significant reticulocytosis in cord blood was not seen in babies with the risk of ABO incompatibility. Though Direct coomb's test was positive only 15 % of babies with pathological hyperbilirubinemia, all babies with positive direct coomb's test developed pathological hyperbilirubinemia.

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