Predicting pathological jaundice in term babies with ABO setting using cord blood bilirubin

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ABSTRACT

Background: Cord blood bilirubin analysis helps not only in predicting the pathological jaundice in ABO incompatibility but is also useful for early referral and intervention for better outcome. **Objective:** The objective of this study was to identify the best cut off value of cord blood bilirubin for predicting pathological hyperbilirubinemia in newborns with ABO setting. **Materials and Methods:** This cohort study was conducted in the Department of Pediatrics at a Medical College during February 2018–July 2018. In this study, healthy term babies with blood Group A, B, and AB born to O positive mothers with birth weight >2.5 kgs and gestational age >37 weeks were included in the study. Cord blood bilirubin and the 4th day (>72 h of life) serum bilirubin value were evaluated. Receiver operating characteristic curve and sensitivity and specificity were used to analyze the data. **Results:** A total of 70 babies were studied; of which, 45 babies developed physiological jaundice and 25 developed pathological jaundice. The mean cord blood bilirubin value of newborns with physiological jaundice was 2.2 mg/dl, while the value among pathological jaundice was 2.6 mg/dl. Taking cord blood bilirubin value of 2.25 mg/dl as cutoff, the sensitivity and specificity of predicting pathological jaundice was 84% and 71.1%, respectively. **Conclusion:** Babies with cord bilirubin >2.25 mg/dl are more prone to pathological hyperbilirubinemia.

Key words: *ABO incompatibility, Cord blood bilirubin, Jaundice*

Cord blood bilirubin analysis helps not only in predicting the pathological jaundice in ABO incompatibility but is also useful for early referral and intervention for better outcome. Jaundice is the most common condition that requires medical attention and neonatal intensive care unit (NICU) admission in newborns [1]. ABO incompatibility is an important cause for pathological jaundice. Jaundice, due to any other cause, is more likely to be more severe in ABO incompatible babies than compatible ones; about 70% of the term and most of the preterm neonates develop hyperbilirubinemia. Furthermore, 6.1% of well term newborn have a maximum serum bilirubin level >12.9 mg/dl. A serum bilirubin >15 mg/dl is seen in 3% of normal full-term neonates [2]. As early discharges have become a common practice nowadays in many centers, babies are commonly readmitted after 3 days for the management of jaundice [3]. Screening the cord blood bilirubin levels can be used as a significant modality in identifying babies with ABO setting even in resource-limited center so that they can be referred early and appropriate treatment can be initiated to prevent complications like bilirubin-induced neurological damage (BIND).

ABO incompatibility occurs in about 20–25% of pregnancies, but severe hemolytic disease develops in only one in 10 of such offspring. The exact level of serum bilirubin that can cause brain damage in term and otherwise healthy infant is not predictable. The aim of the study was to evaluate the cord blood bilirubin in predicting pathological hyperbilirubinemia in a term newborn at risk of ABO incompatibility.

MATERIALS AND METHODS

This was a cohort study conducted at the Department of Paediatrics and Neonatology, at a Medical College of South India from February 2018 to July 2018. This study was initiated after getting approval from the institutional ethics committee. A detailed history was taken and cord blood was collected for all the babies born to O positive group mother. On the 4th day, serum bilirubin was collected for those babies with A, B, or AB blood groups. A total of 70 term newborn babies were included in this study.

Inclusion criteria were as follows: Babies with A, B, or AB blood groups born to O positive mothers, with gestational age of more than 37 weeks, birth weight of more than 2.5 kg, and APGAR score of >7 at 1 min of life while the sick newborns admitted in NICU, those who have APGAR score <7 at 1 min, preterm babies <37 weeks, and newborns <2500 g, babies born

to mothers with medical disease such as eclampsia, diabetes, and thyroid and babies with cephalhematoma were excluded from the study.

Written consent was taken regarding the participation of the mother and baby in the study. History of jaundice in previous sibling, if any, was noted. Samples were taken for testing blood grouping, Rh typing, and cord blood hemoglobin, direct Coombs test, and serum bilirubin. Serum bilirubin was estimated by DIAZO method and its value was collected on the 4th day of life (>72 h of life). If bilirubin was more than 15 mg/dl or if the bilirubin levels fall in therapeutic range as per the AAP guidelines for phototherapy for infants of 35 or more weeks of gestation [4], hyperbilirubinemia was taken as pathological.

RESULTS

Of 70 babies who were at risk of ABO incompatibility, 41 (59%) babies were male and 29 (41%) were female. Among the study subjects, 27 (38.5%) belonged to A positive blood group, 39 (55.7%) to B positive, 3 (4.29%) subjects were B negative, and 1 (1.23%) subject was of A negative blood group. None of the baby had AB positive or AB negative blood groups. Of 70 babies, 25 (35.7%) developed pathological jaundice requiring phototherapy and 45 (64.3%) were in physiological range who did not receive any treatment. One baby needed exchange transfusion among 25 babies with pathological jaundice. No babies in the study group developed BIND or kernicterus.

In physiological jaundice group, the mean value of bilirubin on the 4th day of life was 11.05 mg/dl (range - 5.4–14.7 mg/dl), and in pathological jaundice group, it was 16.3 mg/dl (range - 15–21.7 mg/dl). Receiver operating characteristic (ROC) curve of cord blood bilirubin in babies with ABO setting (Fig. 1) showed the cord blood bilirubin value of 2.25 mg/dl. It was found to be a good predictor for pathological jaundice, with an area under the curve of 0.775 and a sensitivity of 84.0% and specificity of 71.1%.

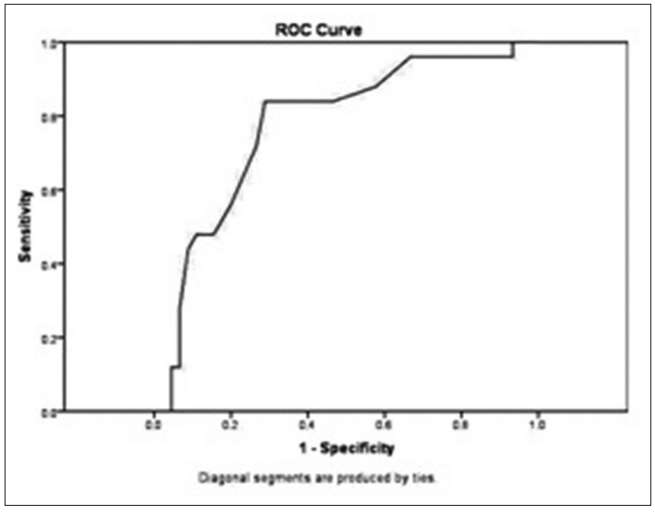

Figure 1: Receiver operating characteristic curve of cord blood bilirubin in babies with ABO setting

The ROC curve of major blood Groups A and B (Fig. 2) showed that the cord blood bilirubin value of 2.25 was found to be a good predictor for pathological jaundice. Among A positive blood group babies, the cord blood bilirubin value cutoff of 2.25 mg/dl showed an area under the curve of 0.739 and a sensitivity of 72.7% and specificity of 81.2%. Similarly, among B positive blood group babies, the cord blood bilirubin value cutoff of 2.25 mg/dl showed good predictability with area under the curve of 0.837, sensitivity of 92.9%, and specificity of 68%. Hence, cord bilirubin level of 2.25 mg% seems to be the best cutoff value for identifying pathological jaundice in our study subjects.

DISCUSSION

Jaundice is the most common condition that requires medical attention in newborns [5]. The problem is that the prediction of jaundice becomes more difficult, especially when babies are discharged early. Neonatal pathological hyperbilirubinemia is a frequent cause of readmission of newborns due to the recent trends of early discharge from hospital.

This study was done to identify the best cutoff value of cord blood bilirubin in predicting the occurrence of pathological hyperbilirubinemia, in babies with ABO setting. It will help such babies to be referred to early and appropriate treatment, which can be initiated even in resource-limited centers. This study showed that newborn with cord blood bilirubin >2.25 mg/dl is prone for pathological hyperbilirubinemia with a sensitivity of 84% and specificity of 71.1%. Rataj *et al.* [6] showed that critical level in cord blood >2.5 mg/dl had probability of 89% for the development of significant hyperbilirubinemia in newborns.

AlaaEldin *et al.* [7] study showed, if cutoff value of cord blood bilirubin is kept as 2.15 mg%, it gives a sensitivity of 50% and specificity of 97% in predicting pathological hyperbilirubinemia. Taksande *et al.* [8] found that the cord serum bilirubin values >2 mg/dl have a sensitivity of 89.5% and specificity of 85% in predicting pathological hyperbilirubinemia. In a study by Rostami and Mehrabi [9], the cutoff point of 2 mg/dl had the sensitivity of 59.2% and the specificity of 48.1%. Krishnan *et al.* [10] study showed that cord bilirubin value of >1.8 has a sensitivity of 72% and specificity of 80% and will identify >70% newborn who might eventually develop significant hyperbilirubinemia.

In a study by Ashish *et al.* [11], a critical cord bilirubin level ≥2.50 mg/dl has sensitivity of 84.1%, specificity of 88.5%, positive predictive value of 98%, and negative predictive value of 45.1% for predicting the risk of developing pathological jaundice in neonates irrespective of the blood groups and risk factors. Out of all the above studies, only Krishnan *et al*. have calculated the cutoff value of cord blood bilirubin in predicting pathological jaundice among healthy term newborns with ABO setting, which is similar to our study.

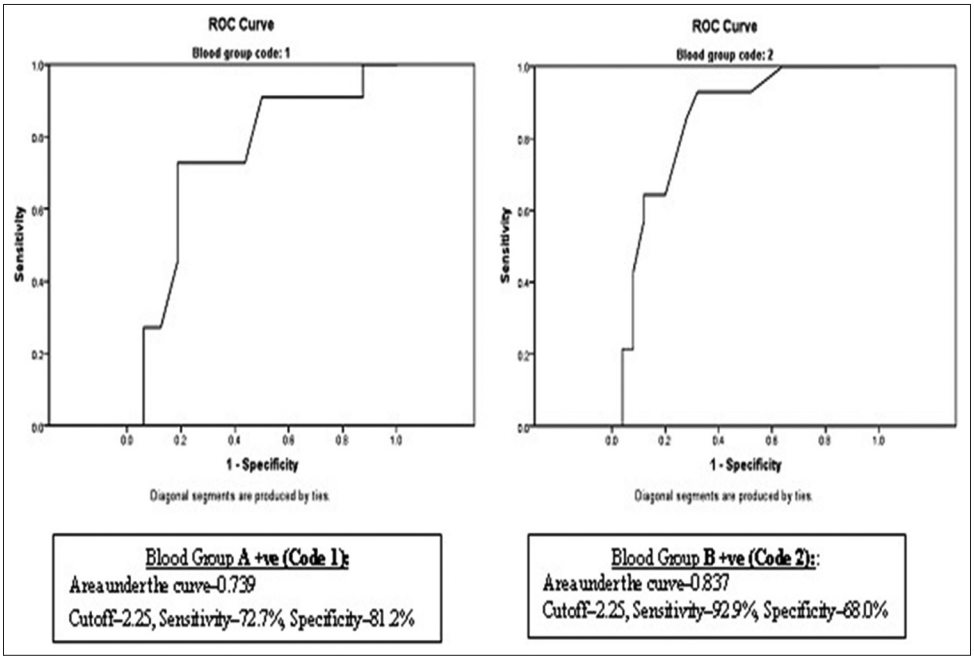

Figure 2: Receiver operating characteristic curve of cord blood bilirubin in relation to blood group

CONCLUSION

Our study shows that cord blood bilirubin value of ≥2.25 mg/dl has a sensitivity of 84% and specificity of 71.1% in predicting the occurrence of pathological hyperbilirubinemia in healthy term newborns with ABO setting.

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