International Journal of Research in Medical Sciences
Krishnan E et al. Int J Res Med Sci. 2016 Oct;4(10):4544-4547
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20163326

Research Article

Evaluation of cord bilirubin and hemoglobin analysis in predicting pathological jaundice in term babies at risk of ABO incompatibility

Elango Krishnan*, Raja Periasamy, Sathiya Priya Sekar

Department of Paediatrics, Stanley Medical College, Chennai, Tamil Nadu, India

Received: 10 August 2016
Revised: 09 September 2016
Accepted: 10 September 2016

***Correspondence:**
Dr. Elango Krishnan,
E-mail: drelangok@gmail.com

ABSTRACT

Background: Cord bilirubin and hemoglobin analysis helps not only in predicting the pathological jaundice in ABO incompatibility but also useful for early referral and intervention for better outcome. Aim of this study is to evaluate the cord blood bilirubin and hemoglobin analysis in predicting pathological hyperbilirubinemia in newborn at risk of ABO incompatibility.
Methods: In this descriptive study conducted in Government Stanley medical college between January 2016-June 2016, A positive or B positive babies born to O positive mothers with birth weight >2.5 kgs and gestational age >37 weeks were included. A total of 191 babies were studied. Cord bilirubin, reticulocyte count, hemoglobin and fourth day bilirubin were evaluated and data was analysed using Pearson's Chi square and ANOVA.
Results: Out of 191 babies, 25 (13%) did not develop any jaundice, 122 (64%) developed physiological jaundice and 44 (23%) had pathological jaundice. The mean cord bilirubin and cord hemoglobin values of newborn who did not develop jaundice were 1.35mg/dl and 15.3g/dl while the values among pathological jaundice were 3.15mg/dl and 14.97g/dl.
Conclusions: Babies with cord bilirubin >1.8mg/dl and hemoglobin <15.1gm/dl are more prone for pathological hyperbilirubinemia.

Keywords: ABO incompatibility, Jaundice, Cord bilirubin

INTRODUCTION

Neonatal jaundice is the most common condition for which a newborn is admitted and evaluated in NICU.[1] 85% of the term and most of the preterm neonates develop hyperbilirubinemia. Also 6.1% of well term newborn have a maximal serum bilirubin level >12.9mg/dl. A serum bilirubin greater than 15mg/dl is seen in 3% of normal full term neonates.[2]

When early discharges are becoming the rule, readmission are commonly referred after 3 days for the management of jaundice with phototherapy.[3] So it becomes all the more important that pathological hyperbilirubinemia is picked up early and treatment started to prevent kernicterus. Biochemical evaluation of total and conjugated bilirubin based on Vanden Bergh reaction is still the gold standard for bilirubin estimation.

ABO incompatibility occurs in about 20-25% of pregnancies but severe hemolytic disease develops in only one in ten of such offspring. The exact level of serum bilirubin that can cause brain damage in term and otherwise healthy infant is not predictable. Screening the babies for cord blood bilirubin and hemoglobin is important not only to protect them from kernicterus but

also to refer to higher centre from secondary/ peripheral care hospitals.

Aim

Aim of the study is to evaluate the cord blood bilirubin and hemoglobin analysis in predicting pathological hyperbilirubinemia in a newborn at risk of ABO incompatibility.

METHODS

This was a descriptive study conducted in Government Stanley medical college between January 2016-June 2016. This study was initiated after getting approval from the institutional ethics committee.

Inclusion criteria

- A positive or B positive babies born to O positive mothers
- Gestational age of more than 37 weeks
- Birth weight of more than 2.5kgs
- Apgar of >7 at 1 minute of life

Exclusion criteria

Birth asphyxia, sepsis, birth trauma and babies born to preeclampsia and diabetic mothers. Written consent taken regarding the participation of the mother and baby in the study. Mothers with blood group O positive without hypertension/ diabetes and babies born to them with more than 7 Apgar were included in the study. Samples were taken for testing blood grouping and typing, serum bilirubin, hemoglobin and direct Coomb's test.

Serum bilirubin was estimated by Diazo method. Reticulocyte count was estimated by supravital staining with brilliant cresyl blue and hemoglobin estimated with autoanalyser. Serum bilirubin collected on fourth day of life of more than 15mg/dl was taken as pathological.

Statistical analysis

The data was analysed using SPSS version 17.0. Pearson Chi square test and ANOVA was used for comparison of multiple variables. Pearson correlation was used for finding correlation between variables and ROC curve used to define sensitivity and specificity of the variables.

RESULTS

Of the 287 babies screened, 191 babies were at risk of ABO incompatibility. Out of that 191 term babies, 86 babies were males which amounts to 45% of the total and 105 were females amounting to 55% of total babies.

70% belonged to birth weight of 2.5-3kgs, 18% to 3-3.5kgs and 12% to 3.5-4 kgs category. Out of 191 babies, 25 (13%) did not develop any jaundice, 122 (64%) developed physiological jaundice and 44 (23%) had pathological jaundice (Figure 1).

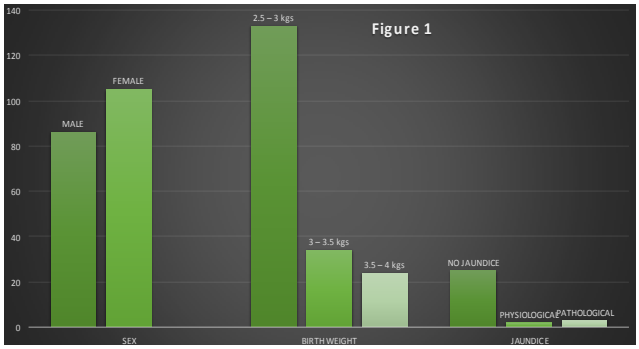

Figure 1: Distribution of sex, birth weight and jaundice of the babies.

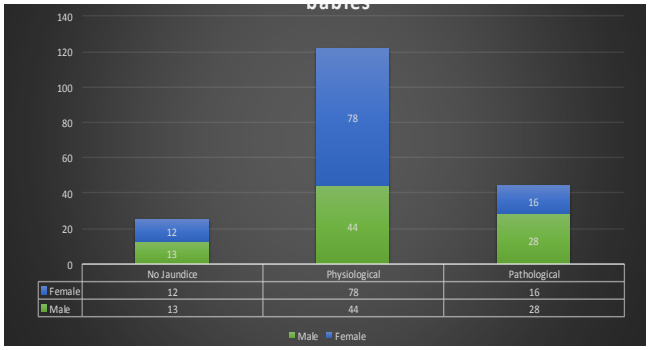

Figure 2: Distribution of jaundice according to the sex of the babies.

The distribution of jaundice between the sex of the babies were shown in Figure 2. There was no statistical significance between the occurrence of jaundice and sex of the babies (p>0.01).

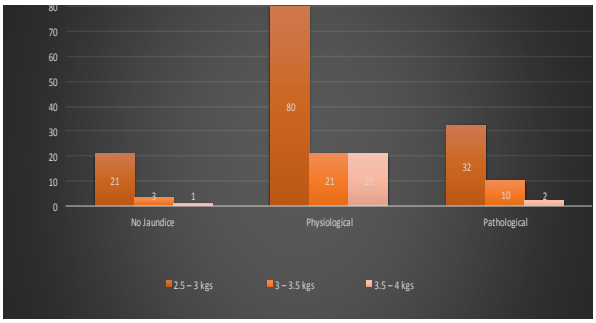

Figure 3: Distribution of jaundice according to birth weight.

Out of 133 babies with birth weight of 2.5-3 kgs, 21 did not develop jaundice, 80 developed physiological jaundice and 32 had pathological jaundice. Among babies with birth weight of 3-3.5 kgs, those who had no jaundice, physiological and pathological jaundice were 3, 21 and 10 respectively and for babies with birth weight of 3.5-4 kgs, the numbers were 1, 21 and 2 respectively

(Figure 3). Out of 191 babies, 113 had a positive blood group and 78 had B positive blood group. Based on the Pearson's Chi square test there was no significant difference due to blood group in occurrence of jaundice ($p>0.01$).

Table 1: Distribution of blood group among various categories of jaundice.

Jaundice	Blood group A	Blood group B
No jaundice	13	12
Physiological	75	47
Pathological	25	19

Table 2: Distribution of cord bilirubin among various categories of jaundice.

Cord bilirubin	Mean	Minimum	Maximum
No jaundice (25)	1.35	0.45	1.79
Pathological (44)	3.15	2.85	4.05
Physiological (122)	2.09	1.01	3.12

The mean cord bilirubin value of newborn who did not develop jaundice was 1.35mg/dl while the mean cord bilirubin value among pathological jaundice was 3.15mg/dl (Table 2) and the difference was statistically significant ($p<0.01$). A 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.

Table 3: Distribution of cord hemoglobin among various categories of jaundice.

Cord hemoglobin	Mean	Minimum	Maximum
No jaundice (25)	15.33	14.5	15.9
Pathological (44)	14.97	13.7	16.1
Physiological (122)	15.29	13.7	16.3

The mean value of cord hemoglobin among neonates with no jaundice was 15.3g/dl while the mean value of cord hemoglobin with pathological jaundice was 14.97g/dl (Table 3) and the difference was statistically significant ($p<0.05$). Direct Coomb's test was positive in 14 babies in pathological jaundice out of which 4 babies needed exchange transfusion. This was statistically significant ($p<0.01$).

A mean reticulocyte count of babies with no jaundice group was 2.8 and that of pathological was 4.15 and the difference was statistically significant ($p<0.01$). A reticulocyte count of >2.5 has 75% sensitivity and 44% specificity. Out of 44 who developed pathological jaundice, 40 required phototherapy and 4 required exchange transfusion.

The babies who required exchange transfusion had a cord blood bilirubin of 3.17mg/dl, 3.20mg/dl, 3.56mg/dl and 4.05mg/dl. Their cord hemoglobin was 15.6gm%, 15.5gm%, 13.8gm% and 13.7gm% respectively. Their reticulocyte count was 4.56%, 4.4%, 4.5% and 5.10% respectively.

Table 4: Distribution of fourth day peak bilirubin among various categories of jaundice.

Fourth day peak bilirubin	Mean	Minimum	Maximum
No jaundice (25)	9.066	6.1	11.2
Pathological (44)	18.09	15.7	22.1
Physiological (122)	13.23	12.1	14.6

Out of 44 who developed pathological jaundice, 40 required phototherapy and 4 required exchange transfusion. The babies who required exchange transfusion had a cord blood bilirubin of 3.17mg/dl, 3.20mg/dl, 3.56mg/dl and 4.05mg/dl. Their cord hemoglobin was 15.6gm%, 15.5gm%, 13.8gm% and 13.7gm% respectively. Their reticulocyte counts were 4.56%, 4.4%, 4.5% and 5.10% respectively.

DISCUSSION

In present study the incidence of hemolytic disease in ABO was was 23% while. Kiruba RHP et al in his study found out that it was 3.7%.[7]

Present study showed that the cord bilirubin >1.8mg/dl and hemoglobin <15.1gm/dl were more prone for pathological hyperbilirubinemia. This was similar to the previous study by Rataj et al in which cord bilirubin of >2.5 were prone for pathological jaundice.[4] Also Maxwell Johnstone says >1.27mg/dl cord bilirubin and cord hemoglobin less than 15.1% has sensitivity of 59% and specificity of 38%.[5]

In present study, Direct Coomb's test was positive in 14 babies in pathological jaundice. Similar results were obtained by Marcello et al who found out that there is potential higher risk of hyperbilirubinemia in the presence of direct Coomb's test.[6] In present study, cord bilirubin has excellent correlation with the fourth day bilirubin level. This results are similar to that of studies done by Graham HWJ, Chen JY, Ling UP et al and Procianoy RS et al.[8-10]

CONCLUSION

Cord blood bilirubin is the best predictor and value >1.8mg/dl are at higher risk for developing pathological hyperbilirubinemia. A cord blood hemoglobin level below 15gm/dl was associated with higher risk of babies to develop pathological hyperbilirubinemia.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Madan A, MacMahon JR, David K. Stevenson. Neonatal hyperbilirubinemia. Avery's disease of the newborn. 8th edition. 1226-56.
2. Cloherty JP, Eichenwald EC, Hansen AR, Ann R. Neonatal hyperbilirubinemia. Stark's manual of Neonatal care 7th edition. 304-39.
3. Liu LL, Clemens CJ, Shay DK, Davis RL, Novack AH. The safety of newborn early discharge: the Washington state experience. JAMA. 1997;278;293-8.
4. Kornacka RJ, Kerman ME. Usefulness of measuring bilirubin levels in cord bllod for predicting hyperbilirubinemia in newborns. Ginekol Pol. 1994;65(6)276-80.
5. Johnstone JM. Department of Pathology, Isleworth. Bilirubin values of cord blood in heterospecific pregnancy. ClinPathol. 1953;6(3);215-8.
6. Orzalesi M, Gloria F, Lucarelli P, Bottini E. Relationship between direct Coomb's test positivity and neonatal jaundice. Paediatrics 1973;51;288-9.
7. Han P, Kiruba R, Ong R, Joseph R, Tan KL, Wong HB. Hemolytic disease due to ABO incompatibility incidence and value of screening in an Asian population. Aust Paediatr J. 1988;24(1);35-8.
8. Whyte J, Graham H. Prediction of the severity of ABO hemolytic disease of the newborn by cord blood tests. Acta Paediatri Scand. 1981;70;217-22.
9. Chen JY, Ling UP. Prediction of the development of neonatal hyperbilirubinemia in ABO incompatibility. 1994;53(1);13-8.
10. Procianoy RS1, Giacomini CB, Farina DM, Mollin GA, Winckler MI, Silveira MB, et al. Early diagnosis of ABO haemolytic disease of the newborn. 1987;146(4);390-3.

Cite this article as: Krishnan E, Periasamy R, Sekar SP. Evaluation of cord bilirubin and hemoglobin analysis in predicting pathological jaundice in term babies at risk of ABO incompatibility. Int J Res Med Sci 2016;4:4544-7.