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Evaluation of Cord Blood Albumin and Cord Blood Bilirubin in Prediction of Neonatal Jaundice

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Abstract

Background: The common physiological problem diagnosed in newborns is hyperbilirubinemia. Severe hyperbilirubinemia requires admission to the hospital after discharging the mother and newborn after delivery. By determining the risk factors of development of jaundice healthcare professionals can design a plan for treatment which can give effective outcomes.

Method: This was a hospital based prospective study. The study consisted of 310 newborns delivered recently at the hospital. Demography and other necessary details were recorded from mother by interviewing. Age of gestation was determined, serum bilirubin and albumin was determined at birth from the cord. The serum bilirubin level was determined at the 4th day after birth. Newborns in the study were followed up for the 4 days from birth.

Results: Among the 310 there were 36 newborns who developed jaundice. 34 out of 36 developed jaundice with cord blood albumin less than 2.8 i.e. 94.4%. 32 out of 36 who developed jaundice had bilirubin levels more than 2, which was 88.8%. there is significant association of the levels of bilirubin and albumin with the development of jaundice.

Conclusion: From this study, albumin of less than 2.8g/dl had significant association with the occurrence of jaundice in neonates. Also cord blood bilirubin > or = 2mg/dl has a significant correlation with development of hyperbilirubinemia requiring intervention. So, cord blood albumin and cord blood bilirubin can predict the vulnerability towards the occurrence of jaundice.

Keywords: Hyperbilirubinemia, Albumin, cord bilirubin, Neonatal jaundice

Introduction

The most common physiological problem diagnosed in newborns is hyperbilirubinemia. Around 66.6% of the neonates have jaundice at birth [1]. Early diagnosis can arrest the progression of the disease whether it is pathological or physiological. The complication can lead to toxic effects of bilirubin on the brain which then becomes irreversible. The pathological conditions that causes jaundice in newborn are related to hemolytic diseases which arise from incompatibility of the ABO antigens, Rh factor and deficiency of factor required for erythropoiesis such as G6PD [2].

The newborns and the mothers are generally discharged after 4-5 days of birth. Diagnosis of hyperbilirubinemia is difficult within this short period.

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Readmission of the neonates is required after discharge within a short period and neonates who have mild hyperbilirubinemia develop severe hyperbilirubinemia within less than 72 hours [3].

Predicting the occurrence jaundice helps in preventing the newborns that are vulnerable. The risk of kernicterus can be prevented only if early diagnosis is done [4,5]. Knowing the risk factors helps healthcare professional to design a plan for the treatment of the neonates demonstrating early symptoms. Hence, this study is conducted to determine the values of cord serum bilirubin level and cord serum albumin level which indicates the development hyperbilirubinemia in the neonates which requires photo treatment and exchange transfusion.

Method

Study design: The present study was a hospital based prospective study and conducted in labour room and SNCU of S.C.B Medical College, Cuttack. from Nov 2013 to May 2015.

Participants: The study consisted of 310 newborns delivered recently at the hospital.

Inclusion criteria

- Full term newborns
- Vaginal delivery and cesarean delivery
- Birth weight greater than or equal to 2.5 kg
- APGAR greater than 7 within 10 min of birth

Exclusion criteria

- Before the term delivery
- Incompatibility of the antigens of RBC
- Born with infection
- Birth asphyxia
- Improperly developed respiratory system
- Meconium stained amniotic fluid
- Neonatal jaundice within 24 hour
- Any congenital anomaly

Demography and other necessary details were recorded from mother by interviewing. Age of gestation was determined, serum bilirubin and albumin was determined at birth from the cord. The serum bilirubin level was determined at the 4th day after birth. Newborns in the study were followed up for the 4 days from the birth. The outcome of the cases are recorded as per the duration of hospital stay, no. of cases relieved, cured and discharged. Serum bilirubin > or = 17mg/dl after 72 hours of birth was considered as hyperbilirubinemia and it was treated accordingly

Ethical consideration: Ethical committee of the institute gave the approval for this study.

Statistical analysis: All the data was entered in Microsoft excel and analysed using SPSS 21.0 software. Statistical data were analysed with the independent sample t test and the descriptive analysis and chi square test, ANOVA test.

Results

Among the total 310 newborns 174 (55%) were male and 136 (45%) were female . Among the 310 there were 36 newborns who developed jaundice. 21 out of 36 developed jaundice, who were male i.e.57.2%. 15 out of 36 who developed jaundice were female i.e. 42.8%. P value is 0.777, which is statistically not significant. 220 out of 310 i.e.70.7% were delivered by vaginal mode. The mode of delivery being LSCS was 90 i.e. 29.3%. 11 out of 36, who developed jaundice, had mode of delivery LSCS i.e. 31.4%. 25 out of 36, developed jaundice were having mode of delivery vaginal its p-value was 0.830, which is statistically not significant.

In 186 mothers of the newborn oxytocin was administered that is about 60% of the cases were given oxytocin. Oxytocin drug usage in this study constitutes to 60%. 16 out of 36 (47.5%) developed jaundice, had not used oxytocin for induction of labor. 20 out of 36 (54.3%) developed jaundice, had used oxytocin for induction of labor. Its p-value was 0.563, which is not statistically significant. Majority of the blood group was O+. B+ was reported in 27% of the cases. 44.9% of newborns started breast feeding between 1 to 6 hour. But, the mean serum bilirubin was highest i.e.18.9 in the newborns who had started breast feeding after 24 hour of life. 26 out of 36 who developed jaundice, were exclusively breast fed i.e. 73%. 6 babies developed jaundice were totally dependent on formula feed i.e. 17%. In present study cohort between 2.5 to 2.8 kg there were 50.5% newborns were included. 36% of newborns were between 2.8 to 3.2 kg. 13.5% newborns were more than 3.2 kg. Majority of babies were between 2.5 to 2.8 kg. 15 out of 36(41.6%) developed jaundice had birth weight between 2.5 to 2.8 kg. 9 out of 36(25.1%) developed jaundice had birth weight more than 3.2 kg.

140 newborns constituting 45.2% of the study cohort had albumin level less than 2.8 mg/ml. 135 newborns (43.5%) had albumin level between 2.9 to 3.3 and 35 newborns (11.3%) had more than 3.4. No new born developed jaundiced at cord blood albumin level of 3.4. So, the new born with cord blood albumin more than or equal to 3.4 can be safely discharged early from the institution. In the study cohort 34 out of 36 developed jaundice with cord blood albumin less than 2.8 i.e. 94.4%. The correlation of development of jaundice and cord albumin level was found to be statistically significant. 76.4% of newborn were having cord blood bilirubin less than 2 and 23.6% were having cord blood bilirubin more than 2. 32 out of 36 who developed jaundice were having

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cord blood bilirubin more than 2, which was 88.8%. 4 out of 36 who developed jaundice had cord blood bilirubin less than 2. 36 out of 310(11.6%) newborn developed neonatal hyperbilirubinemia that is the bilirubin level was more than 17 and they required phototherapy. Table no. 1 summarizes the findings of the study and indicates the significance of the correlation between development of jaundice and various other factors. There is no statistical significance between sex distribution, mode of delivery, use of oxytocin, ABO incompatibility. But, there is significant association between cord blood albumin and bilirubin level with p value < 0.01.

Table 1: Summary of the findings

VARIABLES	PHOTOTHERAPY NO (n = 274)	PHOTOTHERAPY YES (n = 36)	P value
GENDER			0.777
• Male	153(55.8%)	21(57.2%)	
• Female	121(44.2%)	15(42.8%)	
MODE OF DELIVERY			0.83
• LSCS	79(29%)	11(31.4%)	
• Vaginal	195(71%)	25(68.6%)	
OXYTOCIN USE			0.563
• No	108(39.4%)	16(45.7%)	
• Yes	166(60.6%)	20(54.3%)	
CORD BLOOD ALBUMIN (mg/dl)			<0.0001
• <or=2.8	106(38.6%)	34(94.4%)	
• 2.9 – 3.3	133(48.5%)	2(5.6%)	
• >or=3.4	35(12.9%)	0(0%)	
CORD BLOOD BILIRUBIN			<0.0001
• >or= 2	41(15%)	32(88.8%)	
• < 2	233(85%)	4(11.2%)	
ABO INCOMPATIBILITY			0.389
• YES	6(0.02%)	1(0.02%)	
• NO	268(98.8%)	35(98.8%)	

Table no. 2 shows the sensitivity, negative predictive value of cord blood albumin is more than cord blood bilirubin. But, cord blood bilirubin has very high specificity, high positive predictive value. Accuracy of cord blood albumin is 65, but the accuracy of cord blood bilirubin is 85%. So, cord blood bilirubin is a better diagnostic test, but cord blood albumin is a better screening test as cord blood albumin has more sensitivity and more negative predictive value.

Table 2: Sensitivity, specificity, PPV, NPV between cord blood albumin and cord blood bilirubin

	CORD BLOOD ALBUMIN	CORD BLOOD BILIRUBIN
SENSITIVITY	94.40%	89%
SPECIFICITY	61.40%	85%
POSITIVE PREDICTIVE VALUE	24.20%	43%
NEGATIVE PREDICTIVE VALUE	98.80%	98.30%
ACCURACY	65%	85%

Discussion

In this study albumin and bilirubin were examined as tools to predict the risk factor of hyperbilirubinemia. 36 (11.6% of the cases) term, healthy newborn had hyperbilirubinemia which required photo therapy in this study. In other studies, which were done previously the incidence of hyperbilirubinemia, the incidence varies from 8.3% to 12.8% [6,7]. Incidence of hyperbilirubinemia in the present study is 11.6% which correlates with most of the studies mentioned.

In this study, total 310 babies were included i.e.90 (29.3%) babies were born out of LSCS and 220(70.7%) babies were born out of vaginal delivery. Out of 220 cases with vaginal delivery 25 developed significant hyperbilirubinemia and out of 90 cases with LSCS 11 developed significant jaundice. With p value 0.830, the correlation of mode of delivery and occurrence of hyperbilirubinemia was not significant. Taksande et al had similar finding with p-value of 0.527 [8]. Administration of oxytocin had no relation with occurrence of hyperbilirubinemia. The present study is in correlation with other studies, which had similar findings [9,10]. 44.9% of newborn started breast feeding within 1 to 6 hour. But, the mean serum bilirubin was highest i.e. 18.9 mg/dl in the newborns who had started breast feeding after 24 hour of life. Awasthi and Rehman [11], in their study shown that there is no significant association between development of significant jaundice and onset of breast feeding. Taksande et al [8] and Sun et al [9] showed in their study there is significant association between onset of breast feeding and development of jaundice. 140 newborns constituting 45.2% of the study cohort had albumin level less than 2.8 mg/ml. 135 newborns (43.5%) had albumin level between 2.9 to 3.3 and 35 newborns (11.3%) had more than 3.4. No new born developed jaundiced at cord blood albumin level of 3.4. So, the new born with cord blood albumin more than or equal to 3.4 can be safely discharged early from the institution. In the study cohort 34 out of 36 developed jaundice with cord blood albumin less than 2.8 i.e. 94.4%. The correlation of development of jaundice and cord albumin level was found to be statistically significant. This was consistent with findings

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of other study [10]. 36 out of 310 developed significant hyperbilirubinemia. 32 out of 36, who developed jaundice had cord blood bilirubin >or=2, which is 88.8%. 4 out of 36, who developed jaundice had cord blood bilirubin < 2. At cord blood bilirubin 2, the study has sensitivity of 88.8%, specificity of 85%, positive predictive value 43%. Negative predictive value 98.3% with p value <0.0001. The findings correlated with findings of other studies [8,12]. From 36 newborns, who developed jaundice, all required phototherapy, but no newborn in this study required exchange transfusion.

Conclusion and Recommendation

Sex, mode of delivery, use of oxytocin, birth weight, gestational age with jaundice is not associated with significant hyperbilirubinemia**.** Cord blood albumin of < or = 2.8g/dl increases the incidence of hyperbilirubinemia. Also cord blood bilirubin > or = 2mg/dl has a significant correlation with development of hyperbilirubinemia requiring intervention. So, cord blood albumin and cord blood bilirubin can be used as a risk indicator to predict significant hyperbilirubinemia.

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