



Cord Blood Albumin as Predictor of Neonatal Hyperbilirubinemia

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Abstract

Background: Neonatal hyperbilirubinemia is most common abnormal physical finding during the first week of life. Albumin would aid in the transport of bilirubin to liver. Lower cord blood albumin would act as predictor of neonatal hyperbilirubinemia.

Methods: This was a prospective observational study carried out among 150 term and preterm babies. Their cord albumin level were estimated. Jaundice was determined by using yellowish discoloration of eyes and skin and Kramer score. Statistics employed include Chi-square test and receiver operator characteristic curve.

Results: Study participants enrolled into the study was 150. Cord albumin was not significantly associated with sex, mode of delivery, gestational age and birth weight but significantly associated with Kramer score and yellowish discoloration of eyes and skin. When albumin was compared against the occurrence of clinical jaundice, sensitivity was found to be 69.44%, specificity was 98.24%, positive predictive value was 92.59% and Negative predictive value 91.05. The receiver operator characteristic curve indicated that the area under the curve was 0.876.

Conclusion: Cord albumin value can be used as a predictor of neonatal jaundice in both term and pre term babies. Our study showed increased specificity than sensitivity which warrants further exploration.

Keywords: Cord blood albumin, Neonatal hyperbilirubinemia, sensitivity, specificity, predictive value.

Introduction

Neonatal jaundice in newborn is common problem. Approximately 85% of all term newborns and most preterm infant develop clinical jaundice. A total serum bilirubin level >15mg/dl is found in 3% on normal term infants⁽¹⁾. Neonatal hyperbilirubinemia is most common abnormal physical examination finding during the first week of life⁽²⁾. American academy of pediatrics recommends that newborn discharged within 48 hrs should have a follow up visit after 48-72 hrs for any significant jaundice and other problems⁽³⁾. In term babies physiological jaundice is seen to be

appear between 36-72 hrs of age, maximum intensity of jaundice is seen on 72-96hrs of life. Serum bilirubin doesn't exceed 15mg/dl and jaundice disappear by 10th day of life⁽²⁾ This recommendation is not appropriate for our country due to limited follow up facilities in the community. These neonates may develop jaundice which may be overlooked or delay in recognition unless the baby is closely followed up.

Concern of neonatologist regarding the earlier discharge are reports of many cases of bilirubin induced cerebral damage identified in healthy term and late preterm infants even without any

complications⁽⁴⁾ Liver is the site where synthesis of albumin, is taking place and one of the function of albumin is that it will bind to indirect bilirubin and helps in the transport. Decreased synthesis of albumin will decrease its transport and binding capacity and hence identification of at risk neonates or neonates with low cord blood albumin levels early, will help to avoid the complication and sequelae associated with neonatal jaundice⁽⁵⁾

By analyzing the infants developing significant neonatal hyperbilirubinemia earlier at birth, we can plan and implement the follow up programme in better and cost effective manner. The present study is done to find out the critical value of cord blood albumin in identifying the subsequent development of significant neonatal jaundice requiring interventions like phototherapy or exchange transfusion.

Methodology

This prospective observational study was carried out at neonatal care unit Rajah Muthiah medical college hospital Chidambaram, after getting permission from the Institute Human Ethical committee clearance. Study was done in 150 hospital born healthy term and latepreterm babies over a period of six months. Inclusion criteria for the study was term and latepreterm babies, birth weight >2.2kg, APGAR score of >7/10 at 5 minutes, delivered via both LSCS, labour natural. Exclusion criteria includes preterm babies, < 34 wks, Rh and ABO incompatibility, neonates at risk of sepsis, instrumental delivery, perinatal asphyxia, meconium stained liquor, infant of diabetic mother, neonatal jaundice within 24 hrs.

The relevant data were obtained from maternal case sheet and by asking history from the mother and 5ml of cord blood was taken after obtained consent from the parents or guardians. The collected cord blood was sent to the laboratory for estimation of cord blood albumin levels by Bromocresol green calorimetric auto analyzer method. According to the cord blood albumin levels babies were categorized into three groups.

Group A cord albumin level <2.8gm/dl, Group B includes albumin levels 2.8-3.3gm/dl and Group C includes babies with albumin > 3.4gm/dl. These neonates were followed up daily for clinical appearance of jaundice till 5th day of life or hospital stay whichever was later as serum bilirubin reaches its peak between 3rd to 5th day in healthy neonates.

Serum bilirubin levels were estimated between 72-96hrs of life for all neonates participated in the study or earlier if clinical examination shows rapid progression of jaundice. The main outcome of the study was inferred in terms of cord albumin levels and significant hyperbilirubinemia which needed phototherapy or exchange transfusion.

All data were entered in EXCEL sheet to prepare master chart. After preparing the master chart the variables were analysed by using the software SPSS VERSION 21. Statistical data were analysed by using Pearson chi square test. Sensitivity, specificity, positive predictive value, negative predictive value were calculated. Cord albumin levels having highest specificity and sensitivity was determined with the Receiver operating characteristics curve (ROC) analysis.

Results

Total study participants were 150. 60% of the study participants were male. 48.7% were born out of first pregnancy. 48% were born out of normal delivery. 33.3% were pre-term babies. 72.7% of the babies had birth weight of less than 3 kgs (Table 1).

33.3% of the study participants had yellowish discoloration to eyes and skin. 68.7% had Kramer score of 2 and 22.7% had Kramer score of 4. 54.7% had cord albumin level of more than 3.3 g/dl while 27.3% had it between 2.8 to 3.3 g/dl (Table 2). On cross tabulation and applying chi square test, no significant association were found between albumin values and other variables like sex, mode of delivery, gestational age and birth weight (Table 3).

As the albumin values increased the lower were the Kramer scores, the above statement was found

to be statistically significant ($P < 0.05$). Similar inverse relationship were found between albumin vales and yellowish discoloration of skin and eyes (Table 2). When albumin was compared against the occurrence of clinical jaundice, sensitivity was

found to be 69.44%, specificity was 98.24%, positive predictive value was 92.59% and Negative predictive value 91.05. The receiver operator characteristic curve indicated that the area under the curve was 0.876.

Table 1: Baseline characteristics of the study participants

Variable	Frequency (n)	Percentage (%)
Sex		
Male	90	60
Female	60	40
Parity		
Primi	73	48.7
Multigravida	77	51.3
Mode of delivery		
Normal	72	48
LSCS	78	52
Gestational Age		
Term	100	66.7
Preterm	50	33.3
Birth weight (Kg)		
< 3	109	72.7
3-3.5	35	23.3
>3.5	6	4

Table 2: Distribution of study participants according to skin discoloration, Kramers score and cord albumin level

Variable	Frequency (n)	Percentage (%)
Yellowish discoloration.		
Yes	50	33.3
No	100	66.7
Kramers score		
2	103	68.7
3	13	8.7
4	34	22.7
Cord albumin levels (g/dl)		
< 2.8	27	18
2.8-3.3	41	27.3
>3.3	82	54.7
Total	150	100

Table: 3 Cross tabulation between cord albumin and other variables

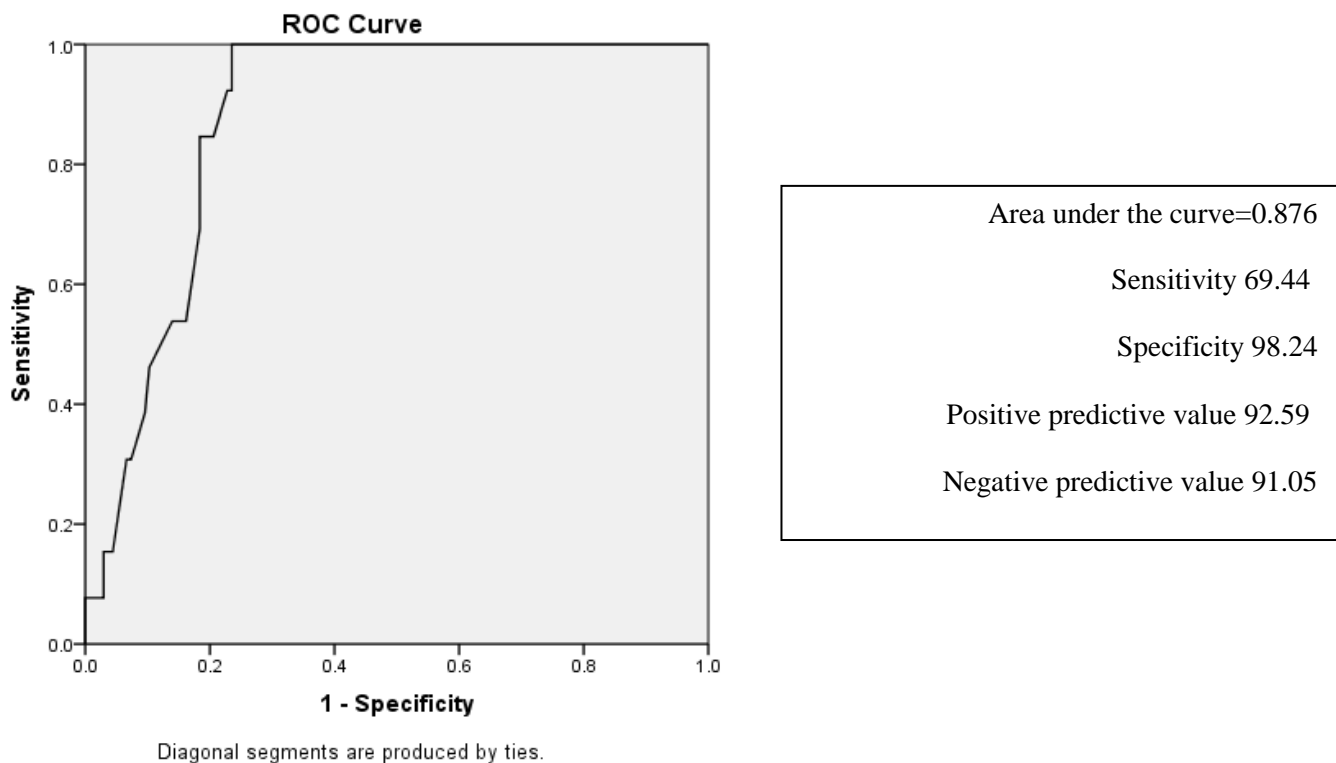
Sex	Cord albumin (g/dl)			X ² -Value	P-value
	< 2.8	2.8-3.3	>3.3		
Male	17	24	49	0.137	> 0.05
Female	10	17	33		
Mode of delivery					
Normal	14	17	41	0.994	>0.05
LSCS	13	24	41		
Gestational age					
Term	21	25	54	2.122	>0.05
Preterm	6	16	28		

Birth weight (Kg)					
< 3	20	29	60	1.61	>0.05
3-3.5	5	11	18		
>3.5	1	3	6		
Kramers score					
2	0	30	73	93.47	<0.05*
3	3	2	8		
4	24	9	1		
Yellowish discoloration					
Yes	18	15	17	19.55	<0.05*
No	9	26	65		
Total	27	41	82		

Table: 4 cross tabulation between Cord albumin and Neonatal jaundice.

Cord albumin (g/dl)	Jaundiced	Not jaundiced	Total
< 2.8	25	2	27
>2.8	11	112	123
Total	36	114	150

Fig 1: ROC curve.



Discussion

This was prospective study done with the objective to find out the critical value of cord blood albumin in detecting the subsequent development of significant neonatal jaundice. The basic hypothesis behind was that lower the albumin levels in cord blood more is the chance for the baby to develop neonatal jaundice.

Neonates have immature liver function compared to adults, which means there is decreased synthesis of all major proteins in newborns. So newborns will be having decreased albumin levels than the adults. Albumin is the carrier protein which aids in the transfer of bilirubin to liver where conjugation occurs. The above process of transport becomes defective or limited in new

born and the severity will be more in preterm babies⁽⁶⁾. Knowledge of the neonates at risk for developing jaundice allows simple bilirubin reducing methods to be implemented before bilirubin reaches critical levels⁽⁷⁾.

In our study no significant relationship were found between cord blood albumin levels and other variables like sex⁽⁸⁾, mode of delivery, gestational age and birth weight. Similar results were reported by Reshad et al⁽⁶⁾.

In present study, among those having cord albumin level of < 2.8g/dl, 92.5% had jaundice while those who had > 2.8g/dl, 8.9% only developed jaundice. Raj RR and Sarangi GD reported that in their study out of 174 study participants 20 developed neonatal jaundice. Among the 20, 19 had albumin levels of less than 2.8g/dl⁽⁷⁾.

Significant association was found between Cord blood albumin values and Kramer score and yellow discoloration of skin and eyes. Low albumin score of < 2.8g/dl was found to be associated with increased Kramer score and yellowish discoloration to skin and eyes. Similar results were obtained in studies by Resahd et al, Sandeep kumar et al⁽⁶⁾⁽⁸⁾

In the present study, Sensitivity was found to be 69.44%, Specificity was 98.24%, positive predictive value was 92.59% and negative predictive value was 91.05%. Area under the curve was found to be 0.876. A study by Reshad et al stated that cord albumin value of < 2.8g/dl had good sensitivity and positive predictive value in both term and pre term babies⁽⁶⁾. cord serum albumin level of <2.8g/dl had sensitivity of 95% and specificity of 62.34%, positive predictive value of 98.97% in predicting the risk of neonatal hyperbilirubinemia reported a study by Raj RR and Sarangi GD⁽⁷⁾. Though many studies has reported a lower specificity, our study had reported a higher specificity but a lower sensitivity than many other studies. The strengths of our study included it looked into both preterm and term babies and is done among the indigenous population

Conclusion

Cord albumin value can be used as a predictor of neonatal jaundice in both term and pre term babies. Our study showed increased specificity than sensitivity which warrants further exploration.

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