Section: Paediatrics

Original Research Article

STUDY OF CORD ALBUMIN AS A PREDICTOR OF SIGNIFICANT NEONATAL HYPERBILIRUBENEMIA IN NORTH KARNATAKA POPULATION

Swetha Sheri[1], Vinut Math[2], Awanti Adarsh[3]

[1]Senior Resident, Department of Paediatrics, ESIC Medical College, Kalaburgi-585102, Karnataka, India.
[2]Senior Resident, Department of Paediatrics, ESIC Medical College, Kalaburgi-585102, Karnataka, India.
[3]Senior Resident, Department of Paediatrics, ESIC Medical College, Kalaburgi-585102, Karnataka, India.

Received : 07/09/2025
Received in revised form : 15/11/2025
Accepted : 03/12/2025

Keywords:
Cord blood Albumin, Beckman coulter AU-480, Kramers's scale, AFGAR score, Total serum Bilirubin.

Corresponding Author:
Dr. Awanti Adarsh,
Email: adarshawanti@gmail.com

DOI: 10.47009/jamp.2025.7.6.112

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (6); 603-606

ABSTRACT

Background: As neonatal jaundice is the most common problem of the first week of life. The majority of neonates discharged within 24 hours of birth are fraught with an increased hyperbilirubinemia, having risk factors that include blood group incompatibility, G6PD deficiency, and postnatal infection. **Materials and Methods:** 90 (ninety) healthy neonates were studied. 2 ml of cord blood was collected from the placental end of the umbilical cord to estimate serum albumin levels. Analyzed using the Beckman Coulter AU-480 Automated Chemistry Analyzer. Based on CBA, neonates were grouped into three (<2.8 g/dL, 2.9-3.3, and >3.3 g/dL). All neonates were assessed for jaundice using the modified Kramer's scale on day 1, day 3, and day 5 of life. **Result:** The correlative study between cord blood albumin (CBA) and hyperbilirubinemia had a significant p-value ($p<0.001$) with 89% sensitivity, 58.3% specificity, 84.3% PPV, 69% NPV, and 80.93% diagnostic accuracy. **Conclusion:** Cord blood albumin level <2.8 g/dL is a significant risk for developing neonatal hyperbilirubinemia that requires early intervention, while a cord albumin level >3.3 are probably safe for early discharge. Hence, this parameter helps to identify the risk of neonates. Therefore, a routine CBA study has to be made mandatory to predict the risk factors of neonates before discharge.

INTRODUCTION

Neonatal jaundice is a common problem in the first week of life, occurring in about 60% of full-term and 80% of preterm neonates.[1] The risk factors for developing significant jaundice include blood group incompatibility, glucose-6-phosphate dehydrogenase deficiency, genetic polymorphisms in bilirubin metabolism, and postnatal infection.[2] The diagnosis of jaundice is based on clinical examination and serum bilirubin assessment done at various times, namely in the hospital, at discharge, and during follow-up visits. The guidelines commonly used to initiate phototherapy are the American Academy of Pediatrics (AAP 2004),[3] and the National Institute for Health and Clinical Excellence (NICE 2010). Although several methods are used to predict the need for phototherapy at discharge.

The majority of newborns are discharged within 48 hours of birth, and half within 24 hours of delivery; however, discharge within 24 hours of birth is fraught with an increased chance of readmission and non-compliance of follow-up.[4] Hyperbilirubinemia is the most common reason for readmission following early discharge; hence, an attempt was made to evaluate the cord blood albumin as a predictor of significant neonatal hyperbilirubinemia in healthy neonates.

MATERIALS AND METHODS

90 (ninety) healthy term neonates delivered in ESIC Medical College Hospital, Kalaburgi, Karnataka-585105, were studied.

Inclusion Criteria: Term neonates (gestational age 37-40 weeks) of both genders with the birth weight between 2.5 and 3.8 kg delivered via normal delivery or cesarean section and with APGAR scores ≥ 7 at 1 minute and 10 at 5 minutes. The parents or guardians who gave their consent in writing for the study were selected.

Exclusion Criteria: Neonates with Rh or ABO incompatibility, instrumental delivery (vacuum/forceps), congenital anomalies, or maternal risk factors for neonatal sepsis (e.g., chorioamnionitis, premature rupture of membranes >

ISSN (O): 2687-5365; ISSN (P): 2753-6556

18 hours, foul-smelling liquor) were excluded from the study.

Method: Out of 90 (ninety) neonates, 60% had estimated neonatal jaundice, using Cochrane's formula with 95% confidence intervals and 8% standard error (SE).

At birth, 2 ml of cord blood was collected under aseptic conditions from the placental end of the umbilical cord to estimate serum albumin levels. Samples were immediately sent to the laboratory and analyzed using the Beckman Coulter AU-480 automated chemistry analyzer.

Based on cord blood albumin (CBA) levels, neonates were stratified into three groups: group I ≤ 2.8 g/dL, group II 2.9-3.3 g/dL, and group III > 3.3 g/dL. All neonates were classically assessed for jaundice using the modified Kramer's scale on day 1, day 3, and day 5 of life. If a neonate had a Kramer score ≥ 3, a blood sample was taken to estimate total serum bilirubin (TSB).

Significant neonatal hyperbilirubinemia (NH) was defined as a TSB level ≥ 17 mg/dL and/or the requirement for phototherapy or exchange transfusion as per standard clinical guidelines.

The duration of the study was from January 2025 to July 2025.

Statistical Analysis: Baseline characteristics correlation between cord blood albumin and significant hyperbilirubinemia. Diagnostic predictability of CBA for significant hyperbilirubinemia was studied with mean value (± SD); the groups were studied. The statistical analysis was carried out using SPSS software. The ratio of male and female neonates was 1:1.

RESULTS

Table 1: Baseline characteristics of the study population

37.9 (± 0.92) was the mean gestational age in weeks, and 2.84 (± 0.18) was the mean birth weight (kg). The mode of delivery was 51 (56.6%) vaginal and 39 (43.3%) cesarean. The most common blood group was B+, 48% in mothers and 51.1% in neonates.

Table 2: Correlation between cord blood albumin (CBA) and significant hyperbilirubinemia (TSB > 17 mg/dL).

- In < 2.8 CBA had 17 neonates having TSB > 17, 3 neonates TSB < 17 mg/dL, t-test 17.5, and the p-value is highly significant.
- In the 2.9-3.3 CBA group, 1 neonate had TSB>17 mg/dL, and 2 neonates had TSB <17 mg/dL; the test was 9.8, and the p-value was <0.001, which is highly significant.
- CBA group >3.3 had 1 neonate with TSB >17 mg/dL and 2 neonates with <17 mg/dL; the t-test was 9.8 and p<0.001 (p-value is highly significant).

Table 3: Diagnostic predictability of CBA ≤ 2.8 g/dL for significant hyperbilirubinemia: 89% sensitivity, 58.30% specificity, positive predictive value of 84.36%, negative predictive value (NPV) of 80.93%, and diagnostic accuracy of 80.93%. The significant reverse correlation observed between CBA and TSB (Pearson's R = -0.570) suggested that lower albumin levels were associated with higher bilirubin levels.

Table 1: Baseline characteristics of the study population

Baseline charecterstics	Value
Mean gestational age (weeks)	37.94 (± 0.92)
Mean birth weight (kg)	2.84 (± 0.18)
Mode of delivery	Vaginal – 51 (56.6%) Caeserian – 39 (43.3%)
Most common blood group	B+ in both mothers (48%) and neonates (51%)

Table 2: Correlation between cord blood albumin and significant Hyperbilirubinemea (TSB≥17 mg/dL)

CBA Group (g/dL)	TSB≥ 17 mg/dL (n)	TSB <17 Mg/dL (n)	t test	p value
< 2.8	17	3	17.5	P<0.001
2.9 – 3.3	1	2	9.8	P<0.001
> 3.3	1	2	9.8	P<0.001

Table 3: Diagnostic predictability of CBA≤2.8 g/dL for significant Hyperbilirubinemea

Diagnostic	Values
Sensitivity	89.00%
Specificity	58.30%
Positive predictive value (PPV)	84.36%
Negative predicitive value (NPV)	69.00%
Diagnostic Accuracy	80.93%

Significant inverse correlation was observed between CBA and TSB (Pearsons R-0.570) suggesting that lower albumin levels were associated with higher bilirubin levels.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

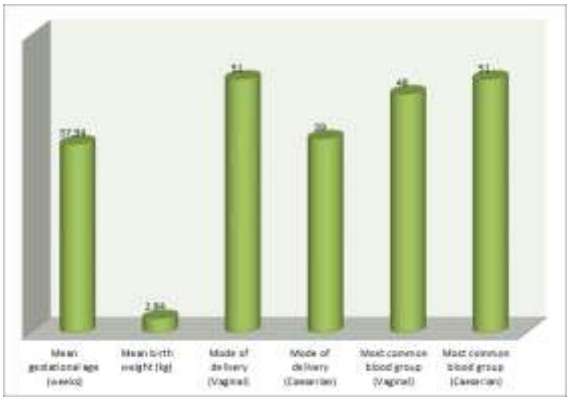

Figure 1: Baseline characteristics of the study population

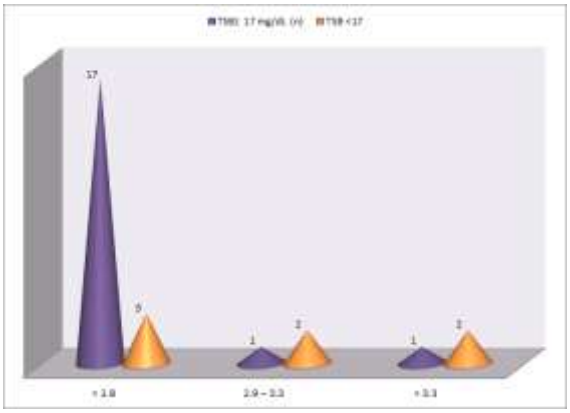

Figure 2: Correlation between cord blood albumin and significant Hyperbilirubinemea (TSB≥17 mg/dL)

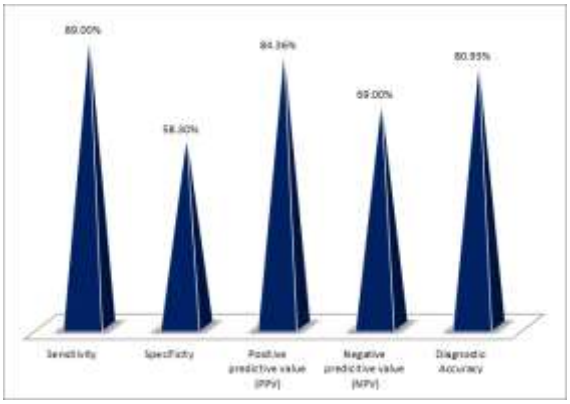

Figure 3: Diagnostic predictability of CBA≤2.8 g/dL for significant Hyperbilirubinemea

DISCUSSION

Present study of cord albumin as a predictor of significant neonatal hyperabilirubinemia in the North Karnataka population. The baseline characteristics were 37.94 (± 0.92) mean gestational age (weeks), 2.84 (± 0.18) mean birth weight (kg), The mode of delivery was 51 (56.6%) vaginal and 39 (43.3%) cesarean. The most common blood group was B+ in both mothers (48%) and neonates (51%) (Table 1). In a correlation study between cord blood albumin and significant hyperbilirubinemia (TSB > 17 mg/dL), < 2.8, 2.9-3.3, and > 3.3 (CBA group g/dL), TSB > 17 mg/dL, and TSB < 17 mg/dL had significant p-values ($p < 0.001$) (Table 2). The diagnostic predictability of CBA ≤ 2.89 g/dL for significant hyperbilirubinemia had 89% sensitivity, 58.30% specificity, 84.36% PPV, 69% NPV, and 80.93% diagnostic accuracy (Table 3). These findings are more or less in agreement with previous studies.[5,6,7]

The liver of neonates is immature compared to adults, and hence the production and synthesis of all the proteins, including albumin, are reduced. Albumin is the major binding protein of bilirubin, which helps in its transport to the liver and thus helps in conjugation. Low levels of albumin will lower its transport and binding capacity. Free albumin can cross the blood-brain barrier.[8]

The clinical manifestations of bilirubin encephalopathy are insidious and progress rapidly to severe life-threatening conditions. Kernicterus is a sequela of acute bilirubin encephalopathy. This is preventable if detected and treated early. It is reported that 70% of neonates who developed significant neonatal hyperbilirubinemia had a cord serum albumin level of 3.4 g/dL and developed neonatal hyperbilirubinemia.[9]

It is also observed that the prevalence of hyperbilirubinemia is higher in cesarean delivery babies as compared to vaginally born babies. Moreover, neonates born with lower body weight had a higher chance of developing significant icterus.[10] Neonates with low cord blood albumin had a higher risk of development of significant hyperbilirubinemia at the end of 24 and 72 hours of birth.[11] All neonates with significant hyperbilirubinemia usually treated with phototherapy but who do not respond were treated with exchange transfusion.

CONCLUSION

Neonates with a cord blood albumin level more than 2.8 gm/dL can be safely discharged early, whereas neonates with albumin <2.8 g/dL will need close follow-up to check for the development of significant jaundice. Hence routine estimation of cord albumin should be emphasized in all term neonates to prevent morbidity and mortality. This study demands further genetic, embryological, and pathophysiological study because the exact etiology of hyperbilirubinemia in neonates is still uncertain.

Limitation of study: Owing to remote location of research centre, small number of patients and lack of latest techniques, we have limited finding and results.

- This research work was approved by the ethical committee of ESIC Medical College hospital, Kalaburgi, Karnataka-585105.
- No Conflict of Interest
- Self Funding

REFERENCES

1. Bhutani VK, Stark AR: Pre-discharge screening for severe neonatal hyperbilirubinemia identifies who need phototherapy. J. Pediatr. 2013, 167; 477-482.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

2. Slusher TM, Zamora TG: Burden of severe neonatal juindice BMJ paediatr. Open. 2017:1e000105. https://do.org/10.1136/bmjpo.2017.000105 viewed on 3rd February 2025.
3. Kumar P, Dhillan P: Length of stay after childbirth in India. BMC pregnancy childbirth 2020:20:181. http://dio.org/10.1007/BF02859282.
4. Gupta P. Malhotra S: Length of postnatal stay in healthy new borns and rehospitalisation following other early discharge Ind. J. Pediatr. 2006, 73; 897-900.
5. Mishra S, Agarwal R: Juandice in Newborns AIMS NICU protocols 2007
6. Arora R, Amritsar S: Cord serum bilirubin level in predicting the development of significant hyperbilirubinemia in newborns with ABO in compatibility J. Nepal paediatric Soc. 2015, 35; 231-236.
7. Bharat AP: Cord blood bilirubin can be used as early predictor of Neonatal hyperbilirubinemia Phd. Thesis Karnataka Rajiv Gandhi university of health sciences 2011.
8. Venkatamurthy M, Murali SM: Evaluation of cord serum albumin levels as a risk indicator in predicting neonatal jaundice Int. J. health info. Med. Res., 2014, 1 (2); 9-11.
9. Sahus, Abraham R: Cord blood albumin as a predictor of neonatal jaundice Int. J. Biol. Med. Res. 2011, 1 (2); 436-8.
10. Reshad M, Ravichender B: A study of cord blood albumin as a predictor of significant neonatal hyperbilirubinemia in term and preterm neonates Int. J. Res. Med. Science 2016, 4 (3); 887-90.
11. Gaurav Aiyappa KC: Cord blood albumin as a predictor of neonatal hyperbilirubinemia in healthy neonates Int. J. contemp. Pediatr. 2017, 4 (2); 503-506.

ISSN (O): 2687-5365; ISSN (P): 2753-6556