

## Original Research Article

# Utility of cord blood albumin as a predictor of significant neonatal jaundice in healthy term newborns

Yogesh N. Parikh, Jay C. Ghetia\*, Aarti M. Makawana

Department of Pediatrics, PDUMC, Rajkot, Gujarat, India

**Received:** 15 October 2018

**Accepted:** 28 November 2018

### \*Correspondence:

Dr. Jay C. Ghetia,

E-mail: [jayghetia@gmail.com](mailto:jayghetia@gmail.com)

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

**Background:** The aim is to study the association between cord blood albumin level and subsequent development of significant neonatal jaundice (NNJ) in healthy term newborns.

**Methods:** A prospective study was conducted on 106 term healthy neonates. Genders, gestational age, mode of delivery were taken into consideration. It was ascertained that there was no other risk factor for hyperbilirubinemia amongst the neonates. The neonates were divided into two groups based on cord blood albumin level of <3.2gm/dl and >3.2gm/dl.

**Results:** Out of the 106 babies included in the study, 44 babies were under group A (<3.2mg/dl) and 62 babies were under group B(>3.2mg/dl). 24 babies (55%) in group A and 16 babies (26%) in group B developed clinical icterus of which 16(66.6%) in group A and 4(25%) in group B required phototherapy. There was no significant difference between the cases who did and who did not develop significant neonatal jaundice with respect to various factor such as type of delivery, gender and meconium stain liquor.

**Conclusions:** Cord albumin levels help to determine and predict the possibility of hyperbilirubinemia among neonates. Hence this can help to identify the at-risk neonates. So routine determination of cord albumin can be advocated to keep a track on at risk neonates.

**Keywords:** Cord blood albumin, Hyperbilirubinemia, Meconium, Neonatal jaundice

## INTRODUCTION

Neonatal hyperbilirubinemia is considered as the commonest cause for admission to the hospital during neonatal period. Severe hyperbilirubinemia can lead to kernicterus. Hence it is important to evaluate all newborns for clinical signs of hyperbilirubinemia.<sup>1</sup>

Despite improved understanding of the physiologic features of bilirubin and the mechanisms of bilirubin neurotoxicity, our ability to predict which infants are at greatest risk remains imprecise.<sup>2</sup> Early postnatal discharge of healthy term newborns after delivery has become a common practice mostly for medical and social

reasons as well as economic constraints. However, this leads to the risk of readmission to the hospital, mostly for neonatal hyperbilirubinemia.<sup>3</sup> Such readmission, besides involving extra expenses for both the family and the institution and also exposing a probably healthy newborn to the Hospital environment, brings emotional problems and risks of interruption of breastfeeding, and is one of the causes of early weaning.<sup>4,5</sup>

Although the American Academy of Pediatrics recommends that newborns discharged within 48 hours should have a follow-up visit after 2-3 days to detect significant jaundice together with other problems.<sup>6</sup> There are difficulties in complying with these recommendations

in our community due to limited facilities for follow-up and parental noncompliance. Knowledge of infants at risk of developing jaundice allows simple bilirubin reducing methods to be implemented before jaundice becomes significant and could influence a decision regarding early discharge from Hospital.<sup>7</sup> Hence, by predicting the high-risk neonates for subsequent hyperbilirubinemia decreases hospital readmission for hyperbilirubinemia and by predicting the low risk neonates minimize an unnecessary prolongation of hospitalization.

Liver is the site of synthesis of albumin. It binds to unconjugated bilirubin and helps in the transport. This in turn reduces the bilirubin toxicity on the tissues.<sup>8,9</sup>

Low production of albumin will lower its transport and binding capacity and hence determination of at-risk neonates early on will help to avoid the complications associated with neonatal jaundice.<sup>10</sup> The present study was conducted in order to determine the correlation between cord albumin and development of neonatal hyperbilirubinemia.

## METHODS

This was a hospital based, prospective study and was conducted in the department of pediatrics and the department of obstetrics and gynecology, PDU Medical College, Rajkot. The study group consisted of 106 newborn full-term healthy neonates delivered at PDU Medical College and selected randomly during study period. Ethical clearance was obtained from the institutional research board of PDU Medical College, Rajkot.

All the healthy term newborns during the study period were included in the study after obtaining informed written consent from the parents.

### Inclusion criteria

- Term babies of both genders, mode of delivery either normal or cesarean-section, birth weight >2.5kg, baby with meconium stain liquor (only vigorous baby).

### Exclusion criteria

- Neonates with ABO or Rh incompatibility, major congenital malformations, Cephalhematoma, Early onset sepsis, birth asphyxia, respiratory distress and Preterm babies and babies of mother with chronic liver diseases were excluded from the study.

2 ml of cord blood was collected at birth in plain vacuity and immediately was sent for estimation of cord blood albumin in biochemistry laboratory, PDU Medical College, Rajkot. Cord albumin was assessed using the bromocresol green (BCG) technique. Babies were examined on 3rd day of life and 5th day of life for the

presence of icterus. Transcutaneous bilirubin (TcB) estimation done if TcB is >17 mg/dl on 3rd day of life and >20 mg/dl on 5th day of life, child was admitted, and serum bilirubin estimation was done by Jendrassik-Grof method and the results were plotted on the chart to identify the type of intervention the baby required either phototherapy or phototherapy and exchange transfusion both. The data was entered into the performa in which the gender, gestational age, mode of delivery, Cord albumin and total and direct bilirubin of the babies were noted.

## RESULTS

Out of 106 babies included in study, 44(41%) babies have cord blood albumin level is <3.2 gm/dl (Group A) and 62(59%) babies have cord blood albumin level is >3.2 gm/dl (Group B). Among this 24(55%) babies from group A and 16(26%) babies from group B developed jaundice and 16(36%) babies from group A and 4(6.5%) babies from group B require phototherapy. In our study, there is a significant difference in development of jaundice in group A and group B. The p-value is 0.0457. The result is significant at  $p < 0.05$ . This suggest that there are higher chances of development of jaundice if cord blood albumin level is low <3.2 gm/dl at birth.

**Table 1: Number of neonates developed jaundice and required phototherapy.**

Cord blood albumin level (gm/dl)	No. of neonates (N)	No. of neonates developed jaundice	No. of neonates require phototherapy
<3.2 (Group A)	44 (41%)	24 (55%)	16 (36%)
>3.2 (Group B)	62 (59%)	16 (26%)	4 (6.5%)
Total	106 (100%)	40 (37%)	20 (19%)

There is significant difference in requirement of phototherapy in group A and group B. The p-value is 0.0026. The result is significant at  $p < 0.05$ . This suggests that chances of requirement of phototherapy are more in group A as compare to group B.

**Table 2: Gender distribution.**

Gender	No. of neonates (N)	No. of neonates developed jaundice
Male	60(57%)	22(37%)
Female	46(43%)	18(39%)
Total	106(100%)	40(37%)

Out of 106 babies, 60(57%) were male and 46(43%) were female. Among these 22(37%) male babies and 18(39%) female babies developed jaundice. The p-value is 0.8617. The result is not significant at  $p < 0.05$ . So, this study

suggests that there is uniform representation from both the gender with no significant correlation.

Taksande et al which states that there is no relation between neonatal hyperbilirubinemia and the gender of the baby.<sup>11</sup>

Out of 106 babies, 30(28%) was delivered by cesarean section and 76(72%) was delivered by vaginal route. Among these 10(34%) babies delivered by cesarean section and 30(39%) babies delivered by vaginal route developed jaundice. The p-value is 0.6899. The result is not significant at  $p < 0.05$ . There was no relation between the mode of delivery and the development of jaundice. This was in correlation with the studies done by Sahu et al and Sun G et al.<sup>8-12</sup>

**Table 3: Mode of delivery.**

Type of delivery	No. of neonates (N)	No. of neonates developed jaundice
Cesarean section	30 (28%)	10 (34%)
Vaginal route	76 (72%)	30 (39%)
Total	106 (100%)	40 (37%)

Out of 106 babies, 22(21%) was having meconium stain liquor at birth (only vigorous babies) and 84(79%) was having normal liquor. Among these 8(37%) of meconium stain liquor and 32(38%) of normal liquor babies developed jaundice. The p-value is 0.1866. The result is not significant at  $p < 0.05$ . There was no significant correlation between meconium stain liquor and development of jaundice

**Table 4: Association with meconium stain liquor.**

Liquor	No. of neonates (N)	No. of neonates developed jaundice
Meconium stain liquor (vigorous baby)	22 (21%)	8 (37%)
Non-meconium stain liquor	84 (79%)	32 (38%)
Total	106 (100%)	40 (37%)

## DISCUSSION

In the present study, we assessed the ability of cord albumin in assessing and acting as a tool for screening for neonatal jaundice. Albumin in a neonate is the major binder of bilirubin and decreases the binding and transport of bilirubin to other body sites. As the results of the present study indicated that there is a higher chance of development of jaundice in group A as compared to group B and there is significant difference in requirement of phototherapy in group A and group B. Requirement of phototherapy is more if cord blood albumin level is less

than 3.2 gm/dl (Table 1). This is in correlation with Sahu et al<sup>8</sup>, showed that 70% newborn who developed significant neonatal hyperbilirubinemia had cord albumin level  $< 2.8$  gm/dl, 30% newborn had cord albumin level 2.9-3.3 gm/dl and none of the newborns with cord albumin level  $> 3.4$  gm/dl developed hyperbilirubinemia.

This helps to predict the neonates who are at a higher risk of developing jaundice and requirement of phototherapy. With the use of serum cord blood albumin estimation, early screening of high-risk neonate for jaundice is possible and it is useful in routine day to day practice. It decreases hospital readmission for neonatal hyperbilirubinemia.

Neonatal hyperbilirubinemia has no significant correlation with gender, mode of delivery (Table 2 and 3). This result is furthermore supported by Taksande et al, Sun G et al. and Sahu et al respectively.<sup>8,11,12</sup> In present study there is an equal chance of development of neonatal hyperbilirubinemia in both meconium stain liquor (only vigorous child) and clear liquor child (Table 4). So, there was no significant correlation between meconium stain liquor and development of jaundice.

## CONCLUSION

Cord blood albumin level in healthy term neonate helps to predict the possibility of the neonate having hyperbilirubinemia. It helps to determine the neonates who are at a higher risk of developing jaundice. A cord blood albumin value less than 3.2 gm/dl has found to be more associated with clinical icterus and need of phototherapy. There was no significant difference between the cases who did and who did not develop significant neonatal jaundice with respect to various factors such as type of delivery, gender and meconium stain liquor.

## ACKNOWLEDGEMENTS

Authors would like to thank all the members of NICU at K. T. Children Hospital and Obstetrics and Gynaecology Department, P.D.U Medical College Rajkot and also the parents of the newborn for their patience and compliance.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee (Human), P.D.U Medical College, Rajkot, India*

## REFERENCES

1. Sgro M, Campbell D, Shah V. Incidence and causes of severe neonatal hyperbilirubinemia in Canada. Canadian Med Ass J. 2006;175(6):587-90.
2. Maisels MJ, Newman TB. Kernicterus in otherwise healthy, breast-fed term newborns. Pediatr. 1995;96(4):730-3.

3. Lee KS, Perlman M, Ballantyne M, Elliott I, To T. Ass between duration of neonatal hospital stay and readmission rate. *J Pediatr*. 1995;127(5):758-66.
4. Agarwal R, Kaushal M, Aggarwal R, Paul VK, Deorari AK. Early neonatal hyperbilirubinemia using first day serum bilirubin level. *Indian Pediatr*. 2002;39(8):724-30.
5. Maisels MJ, Kring E. Length of stay, jaundice, and hospital readmission. *Pediatr*. 1998;101(6):995-8.
6. American Academy of Pediatrics. Practice parameter: management of hyperbilirubinemia in the healthy term newborn. *Pediatr*. 1994;94:558-65.
7. Carty EM, Bradley CF. A randomized, controlled evaluation of early postpartum hospital discharge. *Birth*. 1990;17(4):199-204.
8. Sahu S, Abraham R, John J, Mathew MA, Res M. Cord blood albumin as a predictor of neonatal jaundice. *Int J Biol Med Res*. 2011;2(1):436-8.
9. Trivedi DJ, Markande DM, Vidya BU, Bhat M, Hegde PR. Cord serum bilirubin and albumin in neonatal hyperbilirubinemia. *Int J Int Sci Inn Tech Sec A*. 2013;2(2):39-42.
10. Bunt JE, Rietveld T, Schierbeek H, Wattimena JD, Zimmermann LJ, van Goudoever JB. Albumin synthesis in preterm infants on the first day of life studied with [1-13C] leucine. *Am J Physiol Gastrointest Liver Physiol*. 2007;292(4):G1157-61.
11. Taks A, Vilhekar K, Jain M, Zade P, Atkari S, Verkey S. Prediction of the development of neonatal hyperbilirubinemia by increased umbilical cord blood bilirubin. *Current Pediatr Res*. 2005;9(1).
12. Sun G, Wang YL, Liang JF, Du LZ. Predictive value of umbilical cord blood bilirubin level for subsequent neonatal jaundice. *Z Safflower Paediatr J Chin J Pediatr*. 2007;45(11):848-52.

**Cite this article as:** Parikh YN, Ghetia JC, Makawana AM. Utility of cord blood albumin as a predictor of significant neonatal jaundice in healthy term newborns. *Int J Contemp Pediatr* 2019;6:102-5.