Galore International Journal of Health Sciences and Research
Vol. 7; Issue: 4; Oct.-Dec. 2022
Website: www.gijhsr.com
Original Research Article *P-ISSN: 2456-9321*

Cord Blood Albumin and Bilirubin as Predictor of Neonatal Jaundice

Dr. Elumalai[1], Dr. R.S. Sethi[2], Dr. Anuj S. Sethi[3]

[1]Senior Resident, Department of Paediatrics, Maharani Laxmibai Medical College, Jhansi
[2]Prof./HOD Paediatrics, Maharani Laxmibai Medical College, Jhansi
[3]Assistant Prof., Paediatrics, Maharani Laxmibai Medical College, Jhansi

Corresponding Author: Dr. Elumalai

DOI: https://doi.org/10.52403/gijhsr.20221003

ABSTRACT

Background: Jaundice in newborn is quite common affecting nearly 60% of term and 80% of preterm neonates during the first 7 days of life. It is the most common cause of readmission in the hospital during early neonatal period.
Aims: To find out the sensitivity of cord blood bilirubin and albumin level in predicting neonatal hyperbilirubinemia in healthy newborn.
Material and Methods: The study was conducted on 200 full term healthy babies delivered by LSCS and were followed up till day 3 of life. 2ml of blood was drawn for estimating albumin and bilirubin in a sterile manner from the umbilical cord & then veni puncture at 72 hrs of life from those neonates for estimation of bilirubin. All these samples were taken to the laboratory immediately.
Results: from 200 babies, 53 babies developed significant hyperbilirubinemia (>15mg/dl) with incidence of 26.5%. The mean weight of these babies was 2.47±0.38kg, mean cord blood bilirubin was 2.83±0.44mg/dl, mean cord albumin was 2.64±0.3 gm/dl and mean total serum bilirubin after 72 hrs of life was 17.31±2.09mg/dl. Cord blood bilirubin ≥2.5mg/dl had a sensitivity of 90.5% and specificity 90.4% in the development of hyperbilirubinemia and had a direct correlation, wherever cord blood albumin ≤2.8gm/dl has sensitivity 86.0% and specificity of 93% and showing an inverse correlation.
Conclusion: Neonates with cord blood bilirubin ≤2. 5mg.dl and cord blood albumin >2.8 can be safely discharged early whereas neonates with bilirubin ≥2.5gm/dl and cord blood albumin ≤2.8g/dl will need close follow up for development of significant hyperbilirubinemia.

Keywords: Hyperbilirubinemia, cord blood, bilirubin, albumin

INTRODUCTION

Jaundice in newborn is quite common affecting nearly 60% of term and 80% of preterm neonates during the first 7 days of life[(1)]. It is the most common cause of readmission in the hospital during early neonatal period[(2)]. Neonatal hyperbilirubinemia is major concern for both parents and paediatrician[(3)]. Hence the early recognition, follow up and treatment of jaundice has become more important. Physiological hyperbilirubinemia results from immature liver cell having very low uridine diphospho-glucuronosyltransferase activity compare to mature hepatocytes. Low concentration of bilirubin binding ligand albumin and higher volume of short life erythrocytes in the circulation[(4)].
Physiological jaundice arises as normal response of the babies, limited activity, to excrete bilirubin in the first few days of life. Every newborn develops an unconjugated bilirubin above 1.0mg/dl[(4)]. Physiological jaundice occurs in approximately 60% of newborn, but few (5-6%) will develop jaundice requiring investigation and treatment. If these neonates are managed inadequately, it may result in death or survival with severe brain damage[(5)]. Early discharge of healthy term newborn after normal vaginal delivery has become a common practice because of medical

reasons, like prevention of nosocomial infection, social reasons like early ceremony and also due to economic constraints. Many have to be readmitted for treatment of hyperbilirubinemia[3]. Requirement of phototherapy based on cord blood bilirubin level has been predicted by many workers in the past[6]. Thus, it is possible to predict hyperbilirubinemia on day one by measurement of cord blood bilirubin at birth, as well as by cord blood albumin level.

Usually, albumin binds with unconjugated bilirubin and protects against kernicterus. Blood albumin in neonates is mostly derived from maternal circulation till liver start synthesis[7]. Neonatal hyperbilirubinemia has multiple etiologies and is detectable risk factor for acute bilirubin encephalopathy and chronic bilirubin encephalopathy. The latter is also known as kernicterus. Kernicterus is clinically characterized by decreased feeding, lethargy, hypo/hypertonia, high pitched cry, retrocollis, impaired upgaze, fever and seizures.

The present study is being conducted to find out the sensitivity of cord blood bilirubin and albumin level in predicting neonatal hyperbilirubinemia in healthy newborn.

MATERIAL AND METHODS

The study was conducted on full term normal babies who were delivered by LSCS in the Department of Obstetrics & Gynaecology, of MLB Medical College, Jhansi and were followed up till day 3 of life. 200 full term healthy newborn were included for the study the inclusion criteria for the study was full term babies born by LSCS, Absence of significant illness requiring NICU admission and absence of major congenital malformations.

Premature delivered babies, Outborn babies, Newborn born to mothers prone for hemolytic disease of newborn (ABO, Rh incompatibility and minor blood incompatibility), Significant illness requiring NICU admission, mother taking drugs causing neonatal hyperbilirubinemia, family history of jaundice, anemia, splenectomy, liver disease, Maternal illness, gestational diabetes mellitus and previous unexpected death of baby were excluded from study.

METHOD

2ml of blood was drawn for estimating albumin and bilirubin in a sterile manner from the umbilical cord & then veni puncture at 72 hrs of life from those neonates for estimation of bilirubin. All these samples were taken with sterile disposable syringes & needles into plain vial and were taken to the laboratory immediately. Blood grouping and Rh typing of mother and baby was done routinely.\

Baby's age, sex, gestational age, birth weight, previous history of jaundice in the family, day of onset of jaundice, pattern of feeding, fever and other neurological symptoms were recorded.

Maternal blood group, Baby's blood group, Cord bilirubin and venous bilirubin levels after 72 hours of birth, Cord albumin levels, Hemoglobin/ CBC, Peripheral smear and reticulocyte count were done to classify and treat the neonatal hyperbilirubinemia accordingly.

Statistical analysis

The main outcome of the study was inferred in terms of neonatal hyperbilirubinemia. All the data was entered in Microsoft excel sheet and SPSS Version 21. Statistical data was analysed with t test, chi-square test and ANOVA to arrive at a correlation between cord blood bilirubin and albumin, with babies' bilirubin after 72 hours.

RESULTS

The study was conducted on 200 full term normal babies who were delivered by LSCS in the Department of Obstetrics & Gynaecology and were followed up till day 3 of life.

Table -1: Birth weight wise distribution of cases

Birth weight (kg)	Total no. of babies	%	Significant hyperbilirubinemia >15mg/dl	%
≥3.0	18	9.0	4	22.2
2.9-2.5	115	57.5	25	21.7
2.4-2.0	67	33.5	24	35.8
Total	200	100	53	

Table -2: Cord blood albumin wise distribution of cases (gm/dl)

Cord blood albumin (gm/dl)	No. of babies (n=200)	%	Significant hyperbilirubinemia ≥15mg/dl	% of significant hyperbilirubinemia
≤2.8	55	27.5	46	83.6
2.9-3.3	16	8.0	6	37.5
> 3.3	129	64.5	1	0.77

Table – 3: Cord blood albumin wise distribution of significant hyperbilirubinemia

Cord blood albumin (gm/dl)	Significant hyperbilirubinemia		Total	Percentage (%)	P value
	Positive (>15mg/dl)	Negative (≤15mg/dl)			
≤2.8gm/dl	46	9	55	83.6	<0.05
>2.8gm/dl	7	138	145	4.8	
Total	53	147	200		

Table -4: Distribution of cases on the basis of cord blood bilirubin (200 cases)

Cord blood bilirubin (mg/dl)	No.	Percentage
≥2.5	62	31.0
<2.5	138	69.0

Table – 5: Cord blood bilirubin wise distribution of significant hyperbilirubinemia

Cord blood bilirubin (mg/dl)	Significant hyperbilirubinemia		Total	P value
	> 15mg/dl (positive)	< 15mg/dl (negative)		
≥2.5	48	14	62	<0.05
<2.5	5	133	138	
Total	53	147	200	

Table -6: Cord blood bilirubin and cord blood albumin sensitivity and specificity wise

	Sensitivity	Specificity
Cord blood bilirubin (≥2.5mg/dl)	90.5%	90.4%
Cord blood albumin (≤2.8gm/dl)	86.0%	93.0%

DISCUSSION

Jaundice is quite common in newborns affecting nearly 60% of term and 80% of preterm during the first week of life. It is the most common cause for hospital readmission during the early neonatal period [(2)].

In the era of 'early discharge' in order not to fail to diagnose significant hyperbilirubinemia and start treatment on time, predicting newborn at high risk of developing hyperbilirubinemia was required. Current practice of early discharge of healthy term neonate is to provide a home environment/emotional bonding with the family members and to decrease nursery overcrowding which in turn helps to decrease hospital acquired infection.

The liver of neonates is immature compared to adults and hence the production and synthesis of all the proteins including albumin is reduced. Albumin is the major binding protein of bilirubin which helps in its transport to liver and thus helps in conjugation. Low levels of albumin will lower its transport and binding capacity. Free bilirubin can cross the blood brain barrier. The clinical manifestations of bilirubin encephalopathy are insidious and progress rapidly to severe life threatening conditions.

In the present study, maximum number (35.8%) of babies with significant hyperbilirubinemia were from 2-2.4kg birth weight group which clearly show that, low birth weight is a risk factor for significant hyperbilirubinemia.

In our study incidence of hyperbilirubinemia was 26.5% which correlated with the study of Zeitoun AA et

al[8] (2013), Trivedi et al[9] (2013), Anand et al[10] (2010) and Mahmaud Alalfy et al[11] (2018) with a incidence of 29.8%, 33.88%, 29.6% and 56.0% respectively.

In our study, out of 200 neonates, 62 neonate had cord blood bilirubin level (>2.5mg/dl), in which 48 (24%) neonates developed significant hyperbilirubinemia (>15mg/dl) at the end of 72 hr with sensitivity 90.5%, specificity 90.4% Our findings are supported by various authors.

Table - 7: Comparison studies of predictive ability of cod blood bilirubin and neonatal hyperbilirubinemia

Studies	Cutoff cord blood bilirubin (mg/dl)	Cutoff for neonatal hyperbili-rubinemia	Sensitivity	Specificity	p value
Jahangir AB et al[12] (2018)	>3	>16	97.06%	99.22%	
Rajkumar M Meshram et al[13] (2019)	>3	≥17	91.67%	84.52%	<0.001
Sahgel P et al[14] (2019)	≥2.02	>14	87.5%	70.8%	
Taksande A et al[15] (2005)	>2	≥17	89.5%	85.0%	0.000
Rudy Satrya et al[16] (2009)	≥2.54	≥12.9	90.5%	85.0%	<0.001
Our study (n=200)	≥2.5	≥15	90.5%	90.4%	<0.05

Thus cord blood bilirubin level appears to be a risk indicator in predicting neonatal hyperbilirubinemia. Cord blood bilirubin level >2.5mg/dl is a high risk factor for future development of neonatal hyperbilirubinemia and cord blood bilirubin <2.5mg/dl is probably safe for early discharge.

In our study, 55 neonates had cord blood albumin ≤2.8g/dl, out of which 46 (83.6%) developed hyperbilirubinemia at end of >72 hr, 16 neonates had serum albumin with 2.9-3.3gm/dl) and out of those 6 developed hyperbilirubinemia and 129 had serum albumin (>3.3gm/dl) out of these 1 developed hyperbilirubinemia.

In our study sensitivity of cord blood albumin for significant hyperbilirubinemia was 86% which correlates with the study of AK Mishra et al[17] (2018) in which cut off for cord blood albumin was <2.8gm/dl with a sensitivity of 94%. In the study of Murali SM et al[18] the cut off cord blood albumin was <2.8gm/dl with a sensitivity of 95%. Thus cord blood albumin level ≤2.8gm/dl is high risk for development of hyperbilirubinemia and > 3.3gm/dl is safer for early discharge.

Table - 8: Comparison of cord serum albumin (CSA) level at risk indicator neonatal hyperbilirubinemia in other studies

Studies	No. of cases	No. of cases with neonatal hyperbilirubinemia	no. of neonatal hyperbilirubinemia cases (Cord serum albumin level in g/dl)			p value
Sahu et al[19] (2011)	40	20	14 (<2.8)	6 (2.9-3.3)	0 (>3.4)	<0.001
Trivedi et al[9] (2013)	605	205	120 (<2.8)	59 (2.8-3.5)	26 (>3.5)	<0.05
Murali et al[18] (2013)	174	20	19 (<2.8)	1 (2.8-3.3)	0 (>3.4)	<0.001
Nithu A et al[20] (2017)	50	21	7 (<2.8)	12 (2.8-3.3)	2 (>3.3)	
Our study	200	53	46 (<2.8)	6 (2.9-3.3)	1 (>3.3)	<0.05

CONCLUSION

Neonatal hyperbilirubinemia is one of the most common and major issue during the neonatal period. Neonates with cord blood bilirubin <2.5mg.dl and cord blood albumin >2.8 can be safely discharged early whereas neonates with bilirubin >2.5gm/dl and cord blood albumin <2.8g/dl will need close follow up for development of significant hyperbilirubinemia. Hence, we recommended that routine estimation of

cord blood bilirubin and cord blood albumin should be done in all term neonates in institutional delivery. This will help to design and implement the follow up programme, in high risk group, effectively and to plan early discharge of babies.

Conflict of Interest: None

Ethical Approval: Approved

REFERENCES

1. Stoll B.J. and Kleigman R.M.: Jaundice and hyperbilirubinaemia in newborn. In: Behrman R.E., Kliegman Rm, Jenson H.B. ed. Nelson

Textbook of Pediatrics 16th edn, WB Saunders Company, 513-517, 2000.
2. Lee K.S., Perlman M. and Ballantyne M.: Association between duration of neonatal hospital stay and readmission rate. J. Pediatr., 127: 758-766, 1995.
3. Seidman DS, Stevenson DK, Ergaz Z, Gale R, Hospital readmission due to neonatal hyperbilirubinemia. Pediatrics, 1995, 96, 727-9.
4. Hinkes MT, Cloherty JP.; Neonatal hyperbilirubinemia. In: Cloherty JC, ed. Manual of Neonatal Care 4 edn. New York; Lippincott-Raven; 1988, 175-209.
5. Arimbawa IM, Soetjiningsih, Kari IK. Adverse effect of hyperbilirubinemia on the development of healthy term infants. Paediatr Indones, 2006; 47; 51-56.
6. Alpay F, Sarici SU, Tosuncuk HD, Serdar MA, Inanç N, Gökçay E The value of first-day bilirubin measurement in predicting the development of significant hyperbilirubinemia in healthy term newborns. Pediatrics. 2000 Aug; 106(2):E16.
7. Shanti Ghosh, S.H. Ahmed, Sudershan Kumari and S.K. Bhargava Neonatal bilirubinaemia and its relationship to long term neurological deficits Ind pediat 1971, vol 8, No 10, 704
8. Zeitoun AA, Elhagrasy HF, Abdelsatar DM. Predictive value of umbilical cord blood bilirubin in neonatal hyperbilirubinemia. Egypt Ped Association Gazette. 2013;61(1):23-30.
9. Dhiraj J. Trivedi, Divya M Markande, Vidya b u, Manali Bhat, Priyanka R Hegde. Cord Serum Bilirubin and Albumin in Neonatal Hyperbilirubinemia. Int. J. Int sci. Inn. Tech. Sec. A, Apr. 2013, 2(2): 39-42.
10. Anand K, Rabindran, Gandhimathi C. Cord bilirubin as a predictor for development of hyperbilirubinemia in term neonates. Int J Pediatr Res. 2016;3(5):308-12.
11. Mahmoud Alalfy, Zahraa Mohamed EzzEldin, Yasmeen Amr Mansi, Marwa basher Mostafa, Ahmed Adel and Ahmed ellithy. Role of Bilirubin and Albumin in Cord Blood as Predictors for Neonatal Hyperbilirubinemia. J Gynecol Res. 2018, 4(2): 208.
12. Jehangir AB. Correlation of cord blood bilirubin values with neonatal jaundice in healthy new-borns: a prospective observational study. Pediatr Neonat boil 2018;3(4):000129.
13. Rajkumar M. Meshram, Saira Merchant, Swapnil D. Bhongade, Sartajbegam N. Pathan. Utility of cord blood bilirubin as a predictors of significant neonatal Hyperbilirubinemia in healthy term neonate. Int J Contemp Pediatr. 2019 Sep;6(5):2058-2063.
14. Sehgal P, Wasim S, Chandar V, Gupta A, Rawat A, Kalra V, et al. Cord bilirubin levels as a predictive marker for neonatal hyperbilirubinemia: A prospective study. BMR Med. 2017;4(1).1-7.
15. Taksande A, Vilhekar K, Jain M, Zade P, Atkari S, Verkey S. Prediction of the development of neonatal hyperbilirubinemia by increased umbilical cord blood bilirubin. Ind Medica. 2005;9(1):5-9.
16. Satrya R, Effendi SH, Gurnida DA. Correlation between cord blood bilirubin level and incidence of hyperbilirubinemia in term new-borns. PaediatricaIndonesiana 2009; 49: 349-354.
17. Mishra AK, Sanyasi Naidu C. Association of cord serum albumin with neonatal hyperbilirubinemia among term appropriate-for-gestational-age neonates. Int J Pediatr Adolesc Med. 2018;5(4):142–144.
18. Venkatamurthy M, Murali SM, Hemachandra K (2014) Evaluation of cord serum albumin level as a risk indicator in predicting neonatal Jaundice. Int J Health Info Med Res 1: 9-11.
19. Suchanda Sahu, Rebecca Abraham, Joseph John, Miss Alina Ann Mathew, Anish Sam George. Cord blood albumin as a predictor of neonatal jaundice. Int J Biol Med Res. 2011; 2(1): 436 – 438.
20. Nithu A. George, Shyam Sudhir M. K. To study the effectiveness of cord blood Albumin as a predictor of neonatal jaundice. Int J Contemp Pediatr. 2017 Mar;4(2):645-648.

How to cite this article: Elumalai, R.S. Sethi, Anuj S. Sethi. Cord blood albumin and bilirubin as predictor of neonatal jaundice. *Gal Int J Health Sci Res*. 2022; 7(4): 14-18. *DOI: https://doi.org/10.52403/gijhsr.20221003*

******