e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2022; 14(9); 436-440

Original Research Article

An Observational Study to Determine the Prediction of Significant Hyperbilirubinemia using 24 Hour Serum Bilirubin

Manoj Kumar[1], Sunil Kishore[2], Shalini Sinha[3]

[1]Department of Pediatrics, SMO, Hajipur, Bihar, India
[2]Assistant Professor, Department of Pediatrics, IGIMS, Patna, Bihar, India
[3]Eye Surgeon, MO, SDH, Danapur, Bihar, India

Received: 12-06-2022 / Revised: 11-07-2022 / Accepted: 25-08-2022
Corresponding author: Dr. Sunil Kishore
Conflict of interest: Nil

Abstract

Background: Neonatal hyperbilirubinemia (NH) is a common problem that affects about 60% of full-term babies and 80% of preterm babies in their first week of life. In places with few resources, it is common for healthy full-term babies to be sent home from the hospital early. This study was done to find out how well serum bilirubin levels at 24 hours can predict significant hyperbilirubinemia later on and to find risk factors in healthy term newborns.

Methods: Serum bilirubin was estimated for all enrolled cases within 18 to 30 hour of life spectrophotometrically using twin Beam method. The babies were then followed up clinically by 2 observers for the appearance and progression of jaundice every 12 hour till discharge from the department of obstetrics and gynaecology and were then admitted with their mothers in step down of NICU. Here they were followed up daily upto fifth day of life. TSB estimation was repeated if the clinical assessment of jaundice was more than 10 mg/dl by any observer using Kramers Rule. Hyerbilirubinemia was defined as TSB level 12 mg/dl between 24 to 48 hour of life 15 mg/dl between 48 to 72 hour of life and 17 mg/dl beyond 72 hours of life

Results: A total of 150 neonates were enrolled in the study. Caesarean delivery was recorded 70%, parity 1 and 2 was found in 25.3% and 36% cases, oxytocin was found in 80% cases and ABO incompatibility was found in 36% cases. A TSB of <6mg/dl at 24 +6hours was present in 100 infants (66.7%). Out of these only two infants developed hyperbilirubinemia subsequently. Specificity was 90.3%, Specificity was 75.4%, Positive predictive value was 56.5% and Negative predictive value was 95%.

Conclusion: TSB at 24+6 hours <6mg/dl has a high predictive value in identifying those infants who are unlikely to develop subsequent hyperbilirubinemia.

Keywords: TSB, neonates, hyperbilirubinemia

Introduction

Neonatal jaundice worries parents and is the most common reason they want to see a doctor after giving birth. [1] In the first week of life, 60% of full-term babies who are healthy have jaundice. 6,1% of healthy, full-term newborns with no known risk

factors have a maximum serum bilirubin level of more than 12,9 mg/dl. [2] Most of the time, it's harmless and doesn't need treatment. Severe hyperbilirubinemia is linked to problems in brain development and kernicterus. Kernicterus has been seen in newborns who are otherwise healthy. [3] Bilirubin poisoning in a newborn's brain can be easily avoided if it is found early. Starting treatment early saves money and does a great job of preventing the neurological effects. In places with few resources, it is common for healthy full-term babies to be sent home from the hospital early. [4] Follow up of neonates discharged early is essential to identify neonates at risk of hyperbilirubinemia.

The American Academy of Pediatrics (AAP) says that babies who are sent home from the hospital within 48 hours should have a follow-up visit to check for serious jaundice and other problems. [5] Follow-up cannot be guaranteed for everyone in places with few resources. Because of this, it is of the utmost importance to be able to accurately predict and find risk factors for neonates who might develop severe hyperbilirubinemia.

To find significant hyperbilirubinemia, different methods were used. Many researchers use cord blood bilirubin levels, pre-discharge hour-specific bilirubin values, and transcutaneous bilirubin estimation to find babies who are at risk. [6-8] There is a lot of disagreement about whether or not the level of bilirubin in cord blood can predict severe hyperbilirubinemia in newborns. [9,10] There has been talk of a strong link between bilirubin levels over 24 hours and the later development of severe Hyperbilirubinemia. In India, there aren't many studies about this. [11] So, this study was done to see if the 24 hour serum bilirubin level could be used to predict serious hyperbilirubinemia.

The objective of the study was to determine the predictive ability of 24 hours serum bilirubin for subsequent significant hyperbilirubinemia in healthy term newborns.

Methods

This cross sectional observational study was conducted among 150 full term healthy newborns delivered at IGIMS, Patna, Bihar, India for a period of 1years.

Inclusion and exclusion criteria

Neonates with gestational age of >37week as measured by New Ballard‟s score and birth weight >2.5 kg were enrolled in study. Neonates with sepsis, birth asphyxia, IUGR, gross congenital anomalies and Rh incompatibility were excluded from this study.

All consecutive inborn neonates who fulfilled the inclusion criteria were recruited after taking consent form parents/mother. Clinical data was recorded in a specially designed proforma. Maternal data recorded include use of medications, blood group, and oxytocin induction during labour, maternal diabetes and pregnancy induced hypertension. Neonatal data recorded include mode of delivery, Apgar score at1mim and 5min, gender, weight, gestational age by modified Ballard score and occurrence of sepsis, respiratory distress and apnoea. Serum bilirubin and blood grouping of all neonates were estimated on venous blood sample collected at 24±2 hours of life. The newborns were followed up for 5 day period with daily physical examination according Kramer dermal zones.

Bilirubin Estimation: Blood samples were drawn by venipuncture into a micro-capillary, which was centrifuged in RM 12 C micro-centrifuge, at the rate of 10000 rpm for 5 min. Bilirubin estimation was done spectrophotometrically using twin beam method (455 and 575 nm wave lengths) and analyzed by Wako Bilirubin Tester Model SE 101 DII. Wako Bilirubin Tester requires only 0.05 ml of serum that can be analyzed directly in the capillary

tube after whole blood sample in the micro-capillary has been centrifuged

The outcome was significant hyperbilirubinemia defined as requiring phototherapy or exchange transfusion according to AAP criteria.Results

Table 1: Baseline characteristics of the study population

Characteristic	No.	Percentage
Caesarean	105	70
Vaginal	45	30
Parity		
1	38	25.3
2	54	36
3	28	18.6
>4	30	20.1
Oxytocin used	120	80
Near term (35-37 wks)	15	10
ABO incompatibility	54	36

Caesarean delivery was recorded 70%, parity 1 and 2 was found in 25.3% and 36% cases, oxytocin was found in 80% cases and ABO incompatibility was found in 36% cases.

Table 2: Showing the distribution of Hyperbilirubinemia cases

TSB at 24+6hours	No. of cases who developed TSB >17mg/dl	No. of cases who did not develop TSB >17mg/dl	Total
>6mg/dl	20	30	50
<6mg/dl	2	98	100

A TSB of <6mg/dl at 24 +6hours was present in 100 infants (66.7%). Out of these only two infants developed hyperbilirubinemia subsequently

Table 3: diagnostic tool of the study (TSB at 24+6 hours >6mg/dl)

Sensitivity	90.3%
Specificity	75.4%
Positive predictive value	56.5%
Negative predictive value	95%

Discussion

The present study found that a TSB level ≤6 mg/dl at 24 ± 6 hour can be used to predict the decreased risk for subsequent hyperbilirubinemia (TSB > 17 mg/dl). Such infants could thus be discharged early without need to follow up for hyperbilirubinemia later

Bhutani et al. [12] looked at a large group of babies and found that babies with hyperbilirubinemia have higher serum bilirubin levels right after birth. The authors made percentile charts of serum bilirubin levels at different ages after birth in babies who did not have a positive direct Coombs test. They found that 6.1% of newborns had serum bilirubin levels above the 95th percentile before they were sent home, and 32.1% of these babies went on to have hyperbilirubinemia. Babies whose TSB levels were below the 40th percentile before they were sent home did

not have hyperbilirubinemia subsequently. However, there was an important source of bias in this study. Out of about 13,000 newborns, only about 25% could have their bilirubin levels measured afterward. Some of the babies were there for follow-up care, and others were sent by their primary doctors. Because of this, a lot of babies were left out. It's likely that babies who didn't have major problems weren't included when these percentile charts were made.

Later, Alpay, et al. [13] reported that TSB levels of =6 mg/dl in the first 24 hours predicted jaundice in all newborns. Awasthi et al. [14] found that a TSB level of 3.99 mg/dl at 18–24 hours could predict hyperbilirubinemia (>15 mg/dl) with a sensitivity and specificity of 67 percent each. In a study by Agarwal et al. [15], the ability of TSB = 6mg/dl at 246 hours of life to predict death was looked at, and it was found to have a sensitivity of 95%, a specificity of 27.2%, and a negative predictive value of 99.3%.

Grover et al. [16] found that the mean TSB level on the first day was 7.716 mg/dl in neonates who later got hyperbilirubinemia, but it was only 5.154 mg/dl in those who didn't. It was clear that there was a difference (p=0.000). ROC curve analysis showed that a first-day TSB value of 6.4 mg/dl was the best predictor of future hyperbilirubinemia, with a sensitivity of 87.5%, a specificity of 80.11%, a positive predictive value of 37.5%, and a negative predictive value of 97.92%.

Chawla et al [17] recruited 997 newborns (birth weight: 2627 536 g, gestation: 37.81.5 weeks), and 931 were followed. 344 newborns (34.5%) had low birth weight. Over 80% of hospitalized babies exclusively breastfed. Using 40th, 75th, and 95th percentile hourly bilirubin readings, a nomogram was created. [18] Pre-discharge STB 95th percentile was in high-risk zone, 75th to 94th centile in upper-intermediate risk zone, 40th to 74th centile in lower-intermediate risk zone, and 40th percentile in low-risk zone. 49 newborns with high-risk pre-discharge STB. 34 SHB (positive predictive value: 69.4 percent , sensitivity: 17.1 percent , positive likelihood ratio: 8.26). 342 neonates with low-risk pre-discharge STB developed PHB (negative predictive value: 90.6 percent and specificity: 42.5 percent , positive likelihood ratio: 0.37). This strategy's AUC was 0.73.

Conclusion:

TSB at 24+6 hours <6mg/dl has a high predictive value in identifying those infants who are unlikely to develop subsequent hyperbilirubinemia.

References

1. Anthony JP, Barbara JS. The new born infant,Digestive system disorders: Jaundice andhyperbilirubinemia in the newborn. In: Richard E.Behrman, Robert M. Kliegman, Hal B., Bonita F.Stanton, Editors, Nelson Textbook of Pediatrics: 18th ed. Philadelphia: Saunders Elsevier; 2008:756-66.
2. Mary LP, Gregory, Martin CR, Cloherty JP. Neonatal Hyperbilirubinemia. In Cloherty JP, Eichenwald EC, Hansen AR, Stark AR eds. Manualof neonatal care: 7th Ed. New Delhi: WoltersKluwer.2012:304-39.
3. Maisles MJ, Newman TB. Kernicterus in otherwise healthy breast-fed Term Newborns. Pediatrics.1995;96:730-3.
4. Catz C, Hanson JW, Simpson L, Yaffe SJ. Summary of workshop: Early Discharge and Neonatal Hyperbilirubinemia. Pediatrics. 1995; 96:743
5. American Academy of Pediatrics clinical practice guideline and subcommittee on hyperbilirubinemia. Management of hyperbilirubinemia in the newborn Infant 35 or more weeks of Gestation.Pediatrics.2004;114:297-316.

6. Bhutani VK, Jhonson L, Sivieri EM. Predictiveability of a predischarge Hour- specific serumbilirubin for subsequent significant Hyperbilirubin-emia in healthy term and near Newborns. Pediatrics. 1999; 103:6-14.
7. Gupta PC, Kumari S, Mullick DN. Icterometer; useful screening tool for neonatal Jaundice. Indian Pediatr. 1991; 28:473-6.
8. Kumar A, Faridi MM, Singh N, Ahmad SH. Transcutaneous bilirubinometry in the management of bilirubinemia in term neonates. Indian J Med Res.1994; 99:227-30.
9. Rosenfeld J. Umbilical cord bilirubin levels as apredictor of subsequent hyperbilirubinaemia. J FAM Pract. 198 6;23(6):555-8.
10. Risemberg HM, Mazzi E, MacDonald MG, Peralta M, Heldrich F. Correlation of cord bilirubin levels with hyperbilirubinaemia in ABO incompatibility. Arch Dis Child. 1977; 52:219-22.
11. Randev S, Grower N. Predicting neonatal hyperbilirubinemia using first day serum bilirubin levels. Indian J Pediatr. 2010; 77:147-50.
12. Bhutani VK, Johnson L, Sivieri EM. Predictive ability of a pre discharge hour – specific serum bilirubin for subsequent significant hyperbilirubin-emia in healthy term and near term new borns. Pediatrics 1999; 103:6-14
13. Alpay F, Sarici SU, Tosuncuk HD, Serdar MA, Inanc N, Gokcay E. The value of first day bilirubin measurement in predicting the development of significant hyperbilirubinemia in healthy term newborns. Pediatrics 2000;106: e16
14. Awasthi S, Rehman H. Early prediction of neonatal hyperbilirubin-emia. Indian JPediatr 1998; 65:131-139
15. Agarwal R, Kaushal M, Agarwal R, Paul VK, Deorari AK. Early neonatal hyperbilirubineamia using first day serum bilirubin level. Indian Pediatrics 1997; 34:429-432
16. Shivani Randev and Neelam Grover: Predicting Neonatal Hyperbilirubin-emia Using First Day Serum Bilirubin Levels [Indian J Pediatr 2010;77(2): 147-150
17. Umesh Pathak, Deepak Chawla, Saranjit Kaur and Suksham Jain: Bilirubin Nomogram for Prediction of Significant Hyperbilirubinemia in North Indian Neonates October 04, 2012
18. Alsaimary I. E., & Mezban F. H. The Estimation of serum inflammatory cytokines (IL-4, IL 10 and IL 17) and total IgE concentrations in patients with bronchial asthma by ELISA technique. Journal of Medical Research and Health Sciences, 2021;4(1): 1151–1155.