Original Article

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Assessing the Predictive Value of Serum Bilirubin before 6 Hours of Life for Subsequent Hyperbilirubinemia in Healthy Term Neonates

G R Sunilkumar[1], **K. Muralidhar**[2]

[1]Associate Professor, Department of Paediatrics, Subbaiah institute of Medical Sciences, Shivamogga, Karnataka, India, [2]Associate Professor, Department of Pediatrics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India.

Abstract

Background: Hyperbilirubinaemia, presenting as jaundice, is a ubiquitous and frequently benign condition in newborn babies but is a leading cause of hospitalisation in the first week of life. The present study was conducted to assess the predictive value of serum bilirubin before 6 hours of life for subsequent hyperbilirubinemia in healthy term neonates. **Subjects & Methods:** The study was conducted at Department of Pediatrics in a tertiary care hospital from April 2020 to September 2020 among 74 term neonates of both genders were recruited. Total serum bilirubin, direct and indirect bilirubin was estimated first, within 6 hours of life and second, after 72 hours of life by Modified Van den Bergh's kit method. **Results:** Vaginal delivery was seen in 56 and cesarean in 18, parity 1 was present in 40, 2 in 24 and >2 in 10, blood group A was present in 9, B in 15, AB in 20 and O in 28. The mean TSB level (mg/dl) between 2.6- 4.0 was seen in 30, 4.1- 5.5 in 34 and >5.6 in 10 patients. TSB level (mg/dl) between 7.7-10.2 was seen in 7, 10.3-12.7 in 18, 12.8-15.3 in 36 and >15.4 in 13 patients. Hyperbilirubinemia was seen in 2 with bilirubin level between 2.6-4, in 4 with bilirubin level between 4.1-5.5 and 6 with bilirubin level >5.6. The difference was significant (P< 0.05). **Conclusion:** Total serum bilirubin level of >5 mg/dL within 6 hours of birth may be considered as a predictor for risk of subsequent hyperbilirubinemia.

Keywords: Bilirubin, Hyperbilirubinemia, Vaginal

Corresponding Author: K. Muralidhar, Associate Professor, Department of Pediatrics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India.
E-mail: kmuralidhar1963@gmail.com

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Introduction

Neonatal hyperbilirubinaemia is defined as a TSB >5 mg/dL, a commonly encountered clinical condition among newborns. Hyperbilirubinaemia, presenting as jaundice, is a ubiquitous and frequently benign condition in newborn babies but is a leading cause of hospitalisation in the first week of life.[1] In some infants jaundice can become severe, progressing to acute bilirubin encephalopathy and kernicterus with a substantial risk of neonatal mortality and long-term neurodevelopmental impairments.[2] Severe hyperbilirubinaemia and its sequelae continue to occur in industrialised countries with functioning medical systems and a disproportionately high burden also persists in low-income and middle-income countries due primarily to delays in delivering effective treatments that are routinely available in high-income countries.[3]

Nearly 60% of term newborns present with clinical jaundice during the first week of life. Usually, hyperbilirubinaemia occurs in the absence of any underlying diseases; however, it may be associated with severe illnesses such as hemolytic disease, metabolic and endocrine disorders, anatomic abnormalities of the liver, and infections.[4] Acute bilirubin encephalopathy and kernicterus are the two important neurological manifestations of hyperbilirubinaemia. Unmonitored and untreated hyperbilirubinaemia may lead to neurological complications and hence, it is important to identify hyperbilirubinaemia and initiate appropriate treatment.[5]

Bilirubin is the final breakdown product of hemoglobin that is excreted in the bile after conjugation. Depending on the bilirubin levels, jaundice may be physiological or pathological. In neonates, physiological jaundice develops within 2–3 days of birth, with a rise in TSB levels to 6–8mg/dL or to a maximum of 12mg/dL on day 3 and subsequent fall in the TSB level within normal limits.[6] The present study was conducted to assess the predictive value of serum bilirubin before 6 hours of life for subsequent hyperbilirubinaemia in healthy term neonates.

Subjects and Methods

The present study was conducted at Department of Pediatrics in a tertiary care hospital from April 2020 to September 2020 among 74 term neonates of both genders. Parents' consent was obtained.

Data such as birth weight, gestational age, parity, mode of delivery, feeding pattern, APGAR score, mother's blood group, baby's blood group was obtained. Total serum bilirubin, direct and indirect bilirubin was estimated first, within 6 hours of life and second, after 72 hours of life by Modified Van den Bergh's kit method. Results were tabulated and subjected to statistical analysis. A p-value less than 0.05 was considered significant.

Results

Table 1: Distribution of patients

Total- 74		
Gender	**Males**	**Females**
Number	44	30

[Table 1] shows that out of 74 patients, males were 44 and females were 30.

Table 2: Baseline characteristics

Characteristics	Variables	Number	P-value
Mode of	Vaginal	56	0.021
	Caesarean	18	
Parity	1	40	0.01
	2	24	
	>2	10	
Blood group	A	9	0.05
	B	15	
	AB	20	
	O	28	

[Table 2 & Figure 1] shows that vaginal delivery was seen in 56 and caesarean in 18, parity 1 was present in 40, 2 in 24 and >2 in 10, blood group A was present in 9, B in 15, AB in 20 and O in 28. The difference was significant (P< 0.05).

[Table 3] shows that mean TSB level (mg/dl) between 2.6- 4.0 was seen in 30, 4.1- 5.5 in 34 and >5.6 in 10 patients. The difference was significant (P< 0.05).

[Table 4] shows that TSB level (mg/dl) between 7.7-10.2 was seen in 7, 10.3-12.7 in 18, 12.8-15.3 in 36 and >15.4 in 13 patients. The difference was significant (P< 0.05).

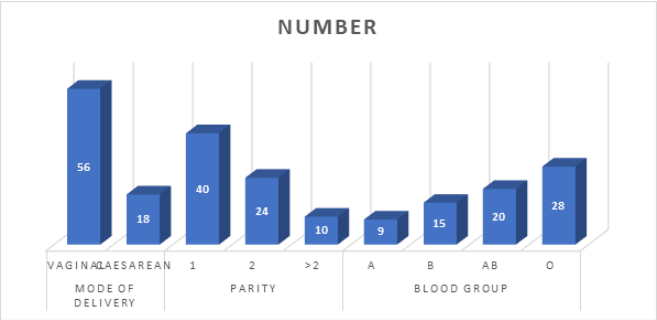

Figure 1: Baseline characteristics

Table 3: Distribution of total serum bilirubin within 6 hours

TSB range within 6 hours	Number	P-value
2.6-4	30	0.05
4.1-5.5	34	
>5.6	10	

Table 4: Distribution of total serum bilirubin after 74 hours

TSB range within 6 hours	Number	P-value
7.7-10.2	7	0.01
10.3-12.7	18	
12.8-15.3	36	
>15.4	13	

Table 5: Prevalence of hyperbilirubinemia based on TSB

TSB range	Hyperbilirubinemia		P-value
	Present	Absent	0.05
2.6-4	2	28	
4.1-5.5	4	30	
>5.6	6	4	
Total	12	62	

[Table 5] shows that hyperbilirubinemia was seen in 2 with bilirubin level between 2.6-4, in 4 with bilirubin level between 4.1-5.5 and in 6 with bilirubin level >5.6. The difference was significant (P< 0.05).

Discussion

Jaundice occurs in most newborn infants. Most jaundice is benign, but because of the potential toxicity of bilirubin, newborn infants must be monitored to identify those who might develop severe hyperbilirubinemia and, in rare cases,

acute bilirubin encephalopathy or kernicterus.[7] Certain factors would predispose the infants to hyperbilirubinaemia and some of the common fetal-maternal risk factors include fetal-maternal blood group incompatibility, prematurity, and a previously affected sibling. Other maternal risk factors are breast-feeding, drugs (diazepam, oxytocin), Asian, Native American ethnicity, and gestational diabetes.[8] Besides the maternal risk factors, neonatal risk factors are birth trauma, certain drugs (sulfisoxazole acetyl, erythromycin ethyl succinate, chloramphenicol), excessive weight loss after birth, infections, infrequent feedings, male gender, polycythemia and delayed meconium passage.[9] neonatal jaundice is benign and no intervention might be required, but jaundice can be associated with an underlying disease condition, which therefore warrants accurate and unbiased estimation of bilirubin.[10] The present study was conducted to assess the predictive value of serum bilirubin before 6 hours of life for subsequent hyperbilirubinaemia in healthy term neonates.

In the present study, out of 74 patients, males were 44 and females were 30. We found that vaginal delivery was seen in 56 and caesarean in 18, parity 1 was present in 40, 2 in 24 and >2 in 10, blood group A was present in 9, B in 15, AB in 20 and O in 28. Bandi et al,[11] determined the predictive value of serum bilirubin before 6 hours of life for subsequent hyperbilirubinemia in healthy term neonates. One hundred and fifty healthy term newborns were included in the study. Serum bilirubin levels were estimated twice, first, within 6 hours of life and second, after 72 hours of life. A measure of TSB levels (within 6 hours of life) across the study population, showed that a maximum number of infants (70/150) had TSB levels between 4.1 and 5.5 mg/dL and 16 infants had TSB levels>5.6 mg/dL. The TSB levels (after 72 hours of life) showed that maximum newborns (83/150) had TSB levels between 12.8 and 15.3 mg/dL and 9 infants had TSB levels between 7.7 and 10.2mg/dL. Eighteen infants developed hyperbilirubinemia. Newborns with a TSB value of >4.95mg/dL within 6hours of life had developed significant hyperbilirubinemia after 72 hours of life with a sensitivity of 100% and specificity of 89% (p=0.0001), which was highly statistically significant.

We observed that mean TSB level (mg/dl) between 2.6- 4.0 was seen in 30, 4.1- 5.5 in 34 and >5.6 in 10 patients. The TSB level (mg/dl) between 7.7-10.2 was seen in 7, 10.3-12.7 in 18, 12.8-15.3 in 36 and >15.4 in 13 patients. Hyperbilirubinemia was seen in 2 with bilirubin level between 2.6-4, in 4 with bilirubin level between 4.1-5.5 and in 6 with bilirubin level >5.6. Diagnosis of hyperbilirubinaemia with the aid of the Kramer index could be deceptive, especially in children with dark skin. If total and direct bilirubin levels are beyond the normal limits (total bilirubin: 0.3–1.2mg/dL, direct bilirubin: 0.0–0.3 mg/dL) then the liver disease could be suspected. Transcutaneous bilimeter (TcB) and/or TSB measurement should be performed on every infant within 8–12 hours after birth. In the event of diagnosing jaundice, subsequent monitoring through TcB or TSB will depend on the nomogram zone.[12]

The limitation of the study is the small sample size.

Conclusion

Authors found that total serum bilirubin level of >5 mg/dL within 6 hours of birth may be considered as a predictor for risk of subsequent hyperbilirubinemia.

References

1. Mishra S, Agarwal R, Deorari AK, Paul VK. Jaundice in the newborns. Indian J Pediatr. 2008;75(2):157–163. Available from: https://dx.doi.org/10.1007/s12098-008-0024-7.
2. Porter ML, Dennis BL. Hyperbilirubinaemia in the term newborn. Am Fam Physician. 2002;65(4):599–607.
3. Management of hyperbilirubinemia in the newborn infant 35 or more weeks of gestation. Pediatrics. 2004;114(1):297–316. Available from: https://doi.org/10.1542/peds.114.1.297.
4. Kramer LI. Advancement of Dermal Icterus in the Jaundiced Newborn. Am J Dis Child. 1969;118(3):454–454. Available from: https://dx.doi.org/10.1001/archpedi.1969.02100040456007.
5. Puppalawar PV, Goswami K, Dhok A. Review on "Evolution of methods of bilirubin estimation". J Dent Med Sci. 2012;1(3):17–28.
6. Barrington KJ, Sankaran K, and. Guidelines for detection, management and prevention of hyperbilirubinemia in term and late preterm newborn infants. J Paediatr Child Health. 2007;12:1–12. Available from: https://dx.doi.org/10.1093/pch/12.suppl_b.1b.
7. Bhutani VK, Johnson L, Sivieri EM. Predictive Ability of a Predischarge Hour-specific Serum Bilirubin for Subsequent Significant Hyperbilirubinemia in Healthy Term and Near-term Newborns. Pediatrics. 1999;103(1):6–14. Available from: https://dx.doi.org/10.1542/peds.103.1.6.
8. Alpay F, Sarici SÜ, 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;106(2):16. Available from: https://dx.doi.org/10.1542/peds.106.2.e16.
9. Agarwal R, Kaushal M, Paul VK. Early neonatal hyperbilirubinaemia using first day serum bilirubin level. Indian Paediatr. 2002;39:724–754.
10. Randev S, Grover N. Predicting neonatal hyperbilirubinemia using first day serum bilirubin levels. Indian J Pediatr. 2010;77(2):147–150. Available from: https://dx.doi.org/10.1007/s12098-009-0335-3.
11. Bandi C, Vanaki R, Badakali AV, Pol RR, Yelamali B. Predictive value of total serum bilirubin within 6 hours of birth for the development of hyperbilirubinemia after 72 hours of birth. J Clin Diagn Res. 2016;10(9):1–4. Available from: https://doi.org/10.7860/jcdr/2016/16314.8460.
12. Olusanya BO, Kaplan M, Hansen TWR. Neonatal hyperbilirubinaemia: a global perspective. Lancet Child Adolesc Health.

2018;2:610–620. Available from: https://dx.doi.org/10.1016/s2352-4642(18)30139-1.

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