

# Evaluation of First Day Serum Bilirubin Level in Prediction of Neonatal Hyperbilirubinemia in Healthy Term Babies at a Tertiary Care Teaching Centre

Vishal Garg<sup>1</sup>, Devendra Kumar<sup>2\*</sup>

<sup>1</sup>Associate Professor, <sup>2\*</sup>Assistant Professor,  
Department of Paediatrics, Saraswati Institute of Medical Sciences, Anwarpur, Hapur, UP, India.

## ABSTRACT

**Background:** Discharge of healthy term infants from the hospital after delivery at progressively initial postnatal ages is recently becoming a common trend for medical, social and economic factors. Different cord blood values have been evaluated before in order to anticipate the clinical outcome of a neonate with ABO incompatibility but the practicality of first-day bilirubin assessment for prediction of the future clinical course is apparently a new concept. The present study was conducted with the aim to evaluate the effectiveness of First Day Serum Bilirubin Level in Prediction of Neonatal Hyperbilirubinemia in Healthy Term Babies.

**Materials and Methods:** The present prospective study was performed in Department of Paediatrics, Saraswati Institute of Medical Sciences, Anwarpur, Hapur, Uttar Pradesh (India) for a period of 1 year. All ill infants and infants with Rh incompatibility were not included in the study. Detailed medical history of all the infants was recorded with special orientation to antenatal, natal, postnatal times in each subject as per the structured proforma. Student t test was used for statistical analysis, probability value of less than 0.05 was regarded as significant.

**Results:** There were 100 subjects with bilirubin <6mg/dl and

50 subjects with bilirubin level >6mg/dl. The birth weight of infants in Group I was 2700 $\pm$ 300 gms and in group II subjects was 2700 $\pm$ 300 gms. There was a significant difference in the level of bilirubin on all days.

**Conclusion:** Bilirubin level estimation at day 1 is a significant predictor of hyperbilirubinemia amongst all the infants.


**Keywords:** Bilirubin, Hyperbilirubinemia, Infant, Postnatal.

## \*Correspondence to:

**Dr. Devendra Kumar,**  
Assistant Professor,  
Department of Paediatrics,  
Saraswati Institute of Medical Sciences,  
Anwarpur, Hapur, UP, India.

## Article History:

Received: 20-07-2018, Revised: 16-08-2018, Accepted: 11-09-2018

Access this article online	
Website: <a href="http://www.ijmrp.com">www.ijmrp.com</a>	Quick Response code 
DOI: 10.21276/ijmrp.2018.4.5.085	

## INTRODUCTION

The infants require the most care for all the neonatal issues for their better outcome in the future time and neonatal hyperbilirubinemia is one such issue; with its opportune detection and treatment a good prognosis can be observed. Discharge of healthy term infants from the hospital after delivery at progressively initial postnatal ages is recently becoming a common trend for medical, social and economic factors. However, it has been observed that newborns whose post-delivery hospital stay is lesser than 72 hours are at an elevated risk for readmission compared to those whose stay is more than 72 hours.<sup>1-5</sup>

Hyperbilirubinemia is the most commonly seen reason for readmission during the initial neonatal time.<sup>1,3,5-9</sup> In United States, it was seen that 22 cases developed kernicterus after discharge within 48 hours of their birth during the time period between 1991 and 1995.<sup>10</sup> Furthermore, one cannot safely rely on

the follow-up visits after early discharge from hospital as it is questionable since 10% of the subjects fail to return to a follow-up visit.<sup>11</sup> Different cord blood values have been evaluated before in order to anticipate the clinical outcome of a neonate with ABO incompatibility but the practicality of first-day bilirubin assessment for prediction of the future clinical course is apparently a new concept. The present study was conducted with the aim to evaluate the effectiveness of First Day Serum Bilirubin Level in Prediction of Neonatal Hyperbilirubinemia in Healthy Term Babies.

## MATERIALS AND METHODS

The present prospective study was performed in Department of Paediatrics, Saraswati Institute of Medical Sciences, Anwarpur, Hapur, Uttar Pradesh (India) for a period of 1 year. The study was approved by the institutional ethical board and all the guardians

were informed about the study and a written consent was obtained from all in their vernacular language. Infants between 35-38 weeks and full term were included in the study. Modified Jendrassik method was used for estimation of serum bilirubin. In case of bilirubin level  $>6\text{mg/dl}$  on 1st day of life was followed measurement after every  $24\pm 6$  hours up to five days. Serum bilirubin levels were measured on day 1, day 3 and day 5. All ill infants and infants with Rh incompatibility were not included in the study. Detailed medical history of all the infants was recorded with special orientation to antenatal, natal, postnatal times in each subject as per the structured proforma. Detailed examination of all the subjects was done and gestational age, birth weight and neurological maturity of each infant was evaluated. Hematological

indices like CBC, reticulocyte count, blood group including Rhesus, hepatic and renal function, direct and indirect bilirubin levels, C-reactive protein estimation were done amongst all cases. Infants with total serum bilirubin more than  $17\text{mg/dl}$  after 24 hours were classified to have significant hyperbilirubinemia, and they underwent phototherapy treatment if their bilirubin level surpassed  $20\text{mg/dl}$  during follow-up. In all subjects gender, birth weight, delivery route, feeding pattern, gestational age, apgar score, chronic illness in mother, maternal age, were noted. All the data thus obtained was arranged in tabulated form and analyzed statistically. Student t test was used for statistical analysis; probability value of less than 0.05 was regarded as significant.

Table 1: Demographic characteristics

Variable	Bilirubin ( $<6\text{mg/dl}$ ) N=100	Bilirubin ( $>6\text{mg/dl}$ ) N=50	P value
Gender (m/f)	60/40	30/20	$>0.05$
Birth weight (gms)	$2700\pm 300$	$2700\pm 300$	$>0.05$
Gestation week	$37\pm 2$	$38\pm 2$	$>0.05$
APGAR score	7	8	$>0.05$
Breast feeding	80	40	$>0.05$
Formula feed	20	10	$>0.05$
Sibling with jaundice	10	5	$>0.05$

Table 2: Early bilirubin level as a predictor of hyperbilirubinemia

Hyperbilirubinemia	Day 1	Day 3	Day 5
Significant (10)	$7.15\pm 1.22$	$13.7\pm 1.34$	$18.94\pm 5.34$
Insignificant (140)	$5\pm 0.65$	$9.77\pm 1.8$	$11.6\pm 2$
P value	$<0.05$	$<0.05$	$<0.05$

## RESULTS

Table 1 illustrates the demographic characteristics of the study. There were 100 subjects with bilirubin  $<6\text{mg/dl}$  and 50 subjects with bilirubin level  $>6\text{mg/dl}$ . The birth weight of infants in Group I was  $2700\pm 300$  gms and in group II subjects was  $2700\pm 300$  gms. The APGAR score in Group I and group II was 7 and 8 respectively. There were 80 subjects who breast fed in group I and 40 in Group II who were breast fed. Rest of the subjects were formula fed. There were 10 subjects in group I and 5 subjects in group II who had sibling with jaundice. There was no significant difference in the demographic variables between the groups.

Table 2 shows the bilirubin as a predictor of hyperbilirubinemia. There was significant hyperbilirubinemia amongst 10 subjects and insignificant hyperbilirubinemia amongst 140 infants. Amongst subjects with significant hyperbilirubinemia, the bilirubin level at day 1 was  $7.15\pm 1.22$ , at day 3 was  $13.7\pm 1.34$  and at day 5 was  $18.94\pm 5.34$ . Amongst subjects with insignificant hyperbilirubinemia the bilirubin level at day 1 was  $5\pm 0.65$ , at day 3 was  $9.77\pm 1.8$  and at day 5 it was  $11.6\pm 2$ . There was a significant difference in the level of bilirubin on all days.

## DISCUSSION

Hyperbilirubinemia is a common problem in neonates. Jaundice is observed in the first week of life in approximately 60% of term and 80% of preterm infants. The greatest risk associated with hyperbilirubinemia is development of neurologic dysfunction.<sup>12</sup>

Neonatal jaundice is a considerable topic of considerable interest amongst pediatricians as it is the most common abnormal clinical finding during the first week of life. It has affected around 70% term and 80% preterm babies.<sup>13</sup> Most of times it is regarded as a physiological event, but in various infants pathological jaundice occurs. Immature neonate brain is prone to toxicity from the unconjugated bilirubin that results in neurodevelopmental handicaps and finally developing frank kernicterus. Therefore, early detection and appropriate treatment of neonatal jaundice is of prime importance in prevention of kernicterus. Routine neonatal hospital stays have reduced markedly in the world since the past 15-20 years, In India, hospital stays of 12 to 24 hours are very commonly used practice. Different studies suggested that neonatal hyperbilirubinemia is the most common reason for readmission of the healthy term infants that are discharged early.<sup>14,15</sup>

Such infants need follow up within 48 hours that is not possible in most cases due to different reasons.<sup>16,17</sup> There are different reports indicating an association between bilirubin values on 1<sup>st</sup> day of life and hyperbilirubinemia. Patra LB carried a study with objective of utility of first day serum bilirubin level in predicting subsequent development of neonatal hyperbilirubinemia in term and near term babies. Mean serum bilirubin level of  $6\text{mg/dl}$  in the first 24 hours of life was determined to have the highest sensitivity to predict the new-borns that would develop significant hyperbilirubinemia.<sup>18</sup>

As per a study by Bhutani et al, they tested this same hypothesis amongst a large cohort in Philadelphia, U.S.A.<sup>19</sup> They concluded that babies who developed hyperbilirubinemia generally have serum bilirubin levels that are at higher percentiles soon after their birth.

In yet another study by Awasthi et al, a level of 3.99 mg/dl was originated to have a sensitivity of approximately 64.2% and 67.4% for requirement of phototherapy.<sup>20</sup> In our study, there was significant hyperbilirubinemia amongst 10 subjects and insignificant hyperbilirubinemia amongst 140 infants. Amongst subjects with significant hyperbilirubinemia, the bilirubin level at day 1 was 7.15 $\pm$ 1.22, at day 3 was 13.7 $\pm$ 1.34 and at day 5 was 18.94 $\pm$ 5.34. Amongst subjects with insignificant hyperbilirubinemia the bilirubin level at day 1 was 5 $\pm$ 0.65, at day 3 was 9.77 $\pm$ 1.8 and at day 5 it was 11.6 $\pm$ 2. There was a significant difference in the level of bilirubin on all days. Mohammad M et al<sup>21</sup> The mean first day TSB level was higher in cases with significant jaundice than that of neonates without significant jaundice (7.4, 3.3 mg dL<sup>-1</sup>, respectively). The best cut off value of TSB at first day in predicting significant hyperbilirubinemia was 6 with a sensitivity of 100.0% and specificity of 100.0% and first day measurements of total serum bilirubin is a good predictor of significant development of hyperbilirubinemia in the subsequent days. The cutoff point is 6 mg dL<sup>-1</sup> in the first day. As per a similar study performed by Seidman et al, the risk of development of hyperbilirubinemia was around 1.6% in subjects whose bilirubin level was lesser than 5mg/dl during 24 hours of life, while the risk was 6.6% amongst subjects whose bilirubin level was around 5mg/dl during 24 hours of life.<sup>22</sup>

## CONCLUSION

Bilirubin level estimation at day 1 is a significant predictor of hyperbilirubinemia amongst all the infants. Early determination of hyperbilirubinemia can help in the early and quick management of subjects with phototherapy. Studies conducted on a larger cohort can help in the determination of this scenario completely.

## REFERENCES

1. Maisels MJ, Kring E. Length of stay, jaundice, and hospital readmission. *Pediatrics*.1998;101:995-8.
2. Lee KS, Perlman M, Bslantyne M. Association between duration of neonatal hospital stay and readmission rate. *J Pediatric*.1995;127:758-66.
3. Soskolne EL, Schumacher R, Fylok C, Young ML, Schork A. The effect of early discharge and other factors on readmission rates of newborns. *Arch pediatric adolescent medicine*. 1996;150:373-9.
4. Liu LL, Clemens CJ, Shay DK, Davis RL, Novack AH. The safety of newborn early. The Washington state experience. *JAMA*.1997;278:293-8.
5. Grupp-phelan J, Taylor JA, Liu LL, Davis RL. Early newborn hospital discharge and readmission for mild and severe jaundice. *Arch Pediatrics Adolescent Medicine*. 1999;153:1283-8.
6. Seidman DS, Stevenson DK, Ergaz Z, Gale R. Hospital readmission due to neonatal hyperbilirubinemia. *Pediatrics*. 1995; 96:727-79.
7. Braveman P, Egerter S, Pwari M. Early discharge of newborns and mothers: a critical review of the literature. *Pediatrics*. 1995;96:716-26.

8. Brown AK, Damus K, Kim MH. Factors relating to readmission of term and near term neonates in the first two weeks of life. *Journal of perinatal medicine*.1999;27:263-75.
9. Britton JR, Britton HL, Beebe SA. Early discharge of the newborn: a continued dilemma. *Pediatrics*.1994;94:291-4.
10. Catz C, Hanson JW, Simpson L, Taffe SJ. Summary of workshop, early discharge and neonatal hyperbilirubinemia. *Pediatrics*. 1995;96:743-5.
11. Conrad PD, Wilkerling RB, Rosenberg AA. Safety of newborn discharge in less than 36 hours in an indigent population. *Am j dis child*. 1989;143:98- 101.
12. Vasudevan J, GMM R, S.Thayumanavan. Usefulness of cord bilirubin as a screening test to predict newborns at risk of hyperbilirubinemia. *Pediatric Oncall Journal July-September 2013*; 10(3). DOI : <https://doi.org/10.7199/ped.oncall.2013.50>
13. Macmohan JR, Stevenson DK, Oski FA. Physiologic Jaundice. In William TH, Robert AB, eds. *Avery's diseases the newborn*, 7th ed. Singapore; Harcourt Asia private limited, 1998: 1003.
14. Maisels MJ, Kring E. Length of stay, jaundice and hospital readmission. *Pediatrics* 1998;101: 995-998.
15. Hall RT, Simon S, Smith MT. Readmission of breast fed infants in the first two weeks of life. *J Perinatol* 2000;20:432- 437.
16. American academy of Pediatrics Provisional Committee for Quality Improvement and Subcommittee on Hyperbilirubinemia. Practice parameter: Management of Hyperbilirubinemia in the healthy term newborns. *Pediatrics* 1994; 94: 558-565.
17. Kramer LL. Advancement of dermal icterus in the jaundiced newborn. *Amer J Dis Child* 1969;118: 454-8.
18. Patra LB. Prediction of neonatal hyperbilirubinemia using first day serum bilirubin level. *Int J Contemp Pediatr* 2016;3:179-82
19. Bhutani VK, Johnson L, Sivieri EM. Predictive ability of predischarge hour specific serum bilirubin for subsequent significant hyperbilirubinemia in healthy term and near- term newborns. *Pediatrics* 1999;103:6-14.
20. Awasthi S, Rehman H. Early prediction of neonatal hyperbilirubinemia. *Indian J Pediatr* 1998; 65: 131-139.
21. Mohammad M, Mazahy, Hany A. Elkhalegy, Tarek M. Emran and Rania Ahmad Abdelhady, Value of First-day Serum Bilirubin Measurement in Predicting the Development of Neonatal Hyperbilirubinemia. *Trends in Medical Research* 2014;9:98-106.
22. Seidman DS, Ergaz Z, Revel-vilk S et al. The use of bilirubin measurements on the first day of life for prediction of neonatal jaundice. Program and abstracts of the Ross special conference, Hot topics'96 in neonatology. Professional services dept., Ross product division, Abbott laboratories.1996:284-94.

**Source of Support:** Nil.

**Conflict of Interest:** None Declared.

**Copyright:** © the author(s) and publisher. IJMRP is an official publication of Ibn Sina Academy of Medieval Medicine & Sciences, registered in 2001 under Indian Trusts Act, 1882. 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.

**Cite this article as:** Vishal Garg, Devendra Kumar. Evaluation of First Day Serum Bilirubin Level in Prediction of Neonatal Hyperbilirubinemia in Healthy Term Babies at a Tertiary Care Teaching Centre. *Int J Med Res Prof*. 2018 Sept; 4(5):363-65. DOI:10.21276/ijmrp.2018.4.5.085