

# Study of Cord Blood Bilirubin and Albumin Levels as Predictors of Subsequent Significant Hyperbilirubinemia in Healthy Newborns

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## Introduction:

Neonatal hyperbilirubinemia needs appropriate and timely treatment no matter whether it is arising from physiological or pathological causes.<sup>1</sup> Adults appear jaundiced when the total serum bilirubin level exceeds 2.0 mg/dl while newborns appear jaundiced when it is >7mg/dl.<sup>2</sup> Clinical jaundice is seen in 60-70% of term and in about 80% of preterm newborns. Serum bilirubin value over 15 mg/dl is found in 3% of normal term newborns. <sup>2,3</sup> Late preterm babies are at higher risk for severe hyperbilirubinemia than term infants since there is decrease in hepatic bilirubin conjugation capacity and decrease in activity of the uridine diphosphate glucuronyltransferase (UDPGT) enzyme, as the gestational age (GA) decreases. <sup>4,5,6</sup> American Academic of Paediatrics (AAP) recommends that newborn discharged within 48 hours should have a follow-up visit after 48 to 72 hours for any significant jaundice and other problems.<sup>7</sup> There are some reliable strategies for prediction of jaundice in neonates, soon after delivery. These are universal follow-up within 1–2 days of early discharge, cord blood albumin levels<sup>8</sup>, cord blood bilirubin concentration at birth <sup>9</sup>, first day serum bilirubin measurement <sup>10</sup>, routine pre-discharge serum bilirubin <sup>11</sup>, transcutaneous bilirubin measurement <sup>12</sup>, and the universal clinical assessment of risk factors of developing jaundice <sup>13</sup>.

**Objective:** To determine the correlation of level of cord blood bilirubin and albumin with development of significant neonatal hyperbilirubinemia in healthy newborns.

**Methodology:** This was an hospital based prospective observational cohort study conducted from January 2019 to October 2019 and included a sample size of 200 with 95% confidence interval. Inclusion Criteria were Newborns delivered at ≥35 weeks of gestation, mode of delivery being Vaginal delivery /LSCS and Apgar score ≥7/10 at 1 minute. A brief antenatal, perinatal, and natal history was obtained and recorded in a predesigned proforma. Immediate post-partum, newborn cord blood sampling was performed to evaluate serum bilirubin (mg/dl) and albumin (g/dl) levels along with routine investigations. Observation for development of jaundice was done till discharge and at time of follow ups; either by Transcutaneous Bilirubinometry (TcB) or serum sample (if necessary). Values of bilirubin acquired by either of these two methods were plotted on hour specific bhutani's bilirubin nomogram. Cord serum bilirubin, cord serum albumin levels and TcB rising rates were compared with levels of bilirubinemia. All neonates assessed clinically, following birth, up to 7<sup>th</sup> postnatal day, for the development of jaundice.

**Result:** In term and near-term newborns, there was no significant

difference in incidence of neonatal hyperbilirubinemia. Requirement of phototherapy was double in newborns of lesser gestational age, mainly because of the lower serum bilirubin cut off levels at which phototherapy is indicated, in that gestational age.

Cord serum bilirubin(CSB) level of ≥ 2.5 mg/dl was the strongest predictor of neonatal hyperbilirubinemia, with odds ratio of 167.706. Cord serum bilirubin level of ≥ 2mg/dl had high specificity and negative predictive value for development of neonatal hyperbilirubinemia and subsequent requirement for phototherapy. Rising rate of TcB ≥ 0.25 mg/dl/hr (in first 24-48 hours of life) was the strongest predictor for requirement of phototherapy with odds ratio of 28.86. Rising rate of TcB ≥ 0.2 mg/dl/hr (in first 24-48 hours of life) had high sensitivity and negative predictive value for development of neonatal hyperbilirubinemia and subsequent requirement for phototherapy. With increasing levels of cord serum bilirubin and increasing rate of TcB rise, the risks of neonatal hyperbilirubinemia and requirement for phototherapy increased, by many folds. Cord serum albumin (CSA) levels of ≤ 2.8 g/dl had high negative predictive value for development of neonatal hyperbilirubinemia and requirement for phototherapy. Cord serum bilirubin to albumin ratio (B/A) had best sensitivity and negative predictive value at > 0.62 for development of neonatal hyperbilirubinemia, with AUC 0.748, on ROC.

## Multivariate Logistic Regressions

	B	S.E	P value	Odds ratio	95% C.I. for Odds ratio	
					Lower	Upper
<b>CSA</b>						
<=2.8	1.678	.575	.004	5.354	1.735	16.521
>2.8				1.00		
<b>CSB</b>						
>=2.5	5.122	1.204	<.0001	167.706	15.838	1775.848
2-2.49	2.871	.771	.0002	17.663	3.898	80.030
<2				1.00		
<b>TcB 1 rising rate</b>						
>=0.25	4.884	.757	<.0001	132.129	29.992	582.103
0.2-0.24	1.354	.617	.028	3.873	1.156	12.981
<0.2				1.00		
<b>B/A</b>						
>0.66	.010	.850	.991	1.010	.191	5.339
0.57-0.66	1.995	.790	.012	7.351	1.563	34.566
<0.57				1.00		

Table No. 1: Neonatal Hyperbilirubinemia

	B	S.E.	P value	Odds ratio	95% C.I. for Odds ratio	
					Lower	Upper
<b>CSA</b>						
<=2.8	1.802	.527	.001	6.059	2.155	17.035
>2.8				1.00		
<b>CSB</b>						
>=2.5	2.982	.976	.002	19.734	2.916	133.556
2-2.49	1.332	.654	.042	3.787	1.050	13.653
<2				1.00		
<b>TcB 1 rising rate</b>						
>=0.25	3.362	.630	<.0001	28.860	8.390	99.278
0.2-0.24	1.297	.614	.035	3.657	1.097	12.190
<0.2				1.00		
<b>B/A</b>						
>0.66	.746	.779	.338	2.108	.458	9.695
0.57-0.66	1.661	.713	.020	5.262	1.300	21.305
<0.57				1.00		

Table No. 2: Phototherapy Requirement

**Conclusion:**

It was concluded that cord serum bilirubin was the strongest predictors of neonatal hyperbilirubinemia and rising rate of TcB was the strongest predictor of subsequent phototherapy requirement.

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