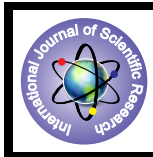


## Study of Correlation of Cord Blood Bilirubin With Neonatal Hyperbilirubinemia.



### Medical Science

**KEYWORDS :** Newborns, NeonateHyperbilirubinemia, Cord blood bilirubin.

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### ABSTRACT

#### INTRODUCTION:

Neonatal hyperbilirubinemia (NH) is a universal problem affecting nearly 60% of term and 80% of preterm neonates during first week of life. In significant number (6.5%) of babies, NH is a cause for readmission. The present study was conducted to correlate the Cord Blood Bilirubin (CBB) level with subsequent NH. Methods: Study was performed at the Department of Pediatrics in a Medical College Hospital and Research Centre. Intramurals delivered, 113 Healthy full-term newborns during 1-year period were prospectively enrolled. CBB was estimated. Serum Bilirubin estimation was done at 48 hours and 5 day of age and later if required. Results: Significant NH in our study is 3.5 %. Mean total bilirubin on second post natal day was 10.58 mg/dl and on fifth post natal day was 10.81 mg/dl. Using CBB level of  $\geq 3$  mg/dl as a cut-off, NH can be predicted with sensitivity of 100%, specificity of 98.17 %, positive predictive value of 66.67 % and negative predictive value of 100%. Conclusion: A 100% Negative Predictive Value in the present study suggests that in Healthy Term babies (without RH and ABO incompatibility with Cord Blood Bilirubin  $\leq 3$  mg/dl) cord serum bilirubin can help to identify those newborns who are unlikely to require further evaluation and intervention. These newborns can be discharged with assurance to Parents. Babies with CBB level  $\geq 3$  mg/dl should be followed more frequently.

### INTRODUCTION:

Jaundice in newborn is a very common problem. Neonatal hyperbilirubinemia (NH) may lead to kernicterus in otherwise healthy newborns. This can be easily prevented if excessive hyperbilirubinemia for age is promptly identified and appropriately treated.<sup>2,3</sup> Newborns can be screened for severity of bilirubinemia before hospital discharge which may help in early detection of the newborns at risk for excessive hyperbilirubinemia during the first week of life.<sup>4</sup>

It is difficult to predict which of these newborns are at risk for developing significant hyperbilirubinemia (Total Serum Bilirubin  $\geq 15$ mg/dl)<sup>5</sup> Significant hyperbilirubinemia is usually found in 3% of normal term babies.<sup>6</sup> Depending on various methods of bilirubin estimation in different laboratories, the frequency of breast feeding, ethnic makeup of people and regional variations the incidence of hyperbilirubinemia changes.<sup>7,8,9</sup> The severe jaundice and kernicterus has been found in some healthy full term newborns discharged early with no apparent hemolysis.<sup>10</sup>

The American Academy of Pediatrics (AAP) recommends that newborns discharged within 48 hours should have a follow-up visit after 2-3 days to detect significant jaundice and other problems.<sup>11</sup> Many investigators have tried to find a simple marker to predict hyperbilirubinemia and its subsequent course in newborns like cord bilirubin estimation,<sup>12,13</sup> bilirubin estimation during 6 to 24 hours of age,<sup>14-17</sup> predischarge hour specific bilirubin estimation<sup>18</sup> and transcutaneous bilirubin measurement.<sup>19,22</sup>

It is with this view that the present study is undertaken to evaluate the predictive ability of cord bilirubin levels for subsequent hyperbilirubinemia in healthy term newborns.

### MATERIAL & METHODS:

This is an Observational Study conducted in Department of Pediatrics of Medical College and Tertiary Health Care Centre from August 2012 to December 2014. Minimum 113 healthy full-term newborns were included after satisfying eligibility criteria. All full term neonates (Gestation age  $\geq 37$  weeks to 42 weeks) irrespective of mode of delivery are included in our study and newborns having risk factors for development of severe hyperbilirubinemia like jaundice observed in first 24 hrs., ABO and/or Rh

incompatibility, cephalohematoma or significant bruising, significant co morbidities requiring N.I.C.U. admission are excluded from our study. Written informed consent is obtained from parents or guardian. Cord blood sample is collected and is used for following investigations:

1. Hemoglobin and Hematocrit.
2. Blood group and Rh factor
3. Serum bilirubin-Total  
Direct  
Indirect

For the present study "Cord Blood Hyperbilirubinemia" is defined as cord blood total bilirubin level  $\geq 3$ mg/dl. (1) Venous blood samples of the neonates are collected at 48 hours and at five days after birth.

The sample was refrigerated between 2-8 degree C till serum bilirubin estimation is done. Serum bilirubin estimation was done within 12 hours of collection of sample by Diazotized sulphanic test. This method for bilirubin estimation is based on principle that Bilirubin reacts with diazotized sulphanic acid in acidic medium to form pink colored azobilirubin with absorbance directly proportional to bilirubin concentration. Direct Bilirubin, being water soluble directly reacts in acidic medium. However indirect or unconjugated Bilirubin is solubilized using a surfactant and then it reacts similar to direct Bilirubin. Additional investigations are done as per the case. The findings of investigations are analyzed by using statistical software.

### RESULTS:

The following results were made from the study. An Observational study consisted of 113 healthy term newborns that were followed up for first 5 postnatal days. The study results were analyzed using appropriate statistical methods.

**TABLE NO.1-STUDY POPULATION AND SIGNIFICANT JAUNDICE**

<b>Total</b>	Significant Jaundice	
	Number	Percentage

113	4	3.5%
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The incidence of significant hyperbilirubinemia in our study population is 3.5 %. Significant jaundice is defined as TSB  $\geq$  15 mg/ dl at 48 hours of life.

**DISCUSSION**

In most of the neonates hyperbilirubinemia is a common problem. During the 1<sup>st</sup> week of life jaundice is seen in approximately 60% of term infants and 80% of preterm infants. Under normal circumstances, the umbilical cord serum indirect bilirubin is 1-3 mg/dl and rises at a rate of <5 mg/dl/day; thus jaundice becomes visible on the 2<sup>nd</sup> or 3<sup>rd</sup> day, usually peaking between the 2<sup>nd</sup> and 4<sup>th</sup> days at 5-6 mg/dl and decreasing to <2 mg/dl between the 5<sup>th</sup> and 7<sup>th</sup> days of life <sup>(3)</sup>

Our study presumption was that a high serum bilirubin level at birth would also predict a high peak later in life. Our aim was to quantify the relationship between Cord blood bilirubin with peak serum bilirubin levels of the first five days. We chose cord blood estimation for initial serum bilirubin estimation as it is easy and a noninvasive way and the results are available within few hours after birth.

Keeping these factors in mind our study was conducted on healthy full term neonates with non-hemolytic jaundice. We have considered peak serum bilirubin level >15 mg/dl as "hyperbilirubinemia" since specific treatment is usually considered at or above this level. However, some neonatologists initiate phototherapy at slightly lower serum bilirubin levels, especially if they suspect a rising trend. Therefore, we have also predicted treatment with phototherapy.

**TABLE NO.2-COMPARISON OF CORD SERUM BILIRUBIN AND SIGNIFICANT JAUNDICE**

Studies	Year	No. Of Cases	Umbilical cord bilirubin	Incidence of Hyperbilirubinemia
Rosenfeld J et al <sup>26</sup>	1986	-	< 2 mg >2mg	4%      25%
Knudsen et al <sup>28</sup>	1989	291	< 1.17 mg > 2.34 mg	2.9%      85%
Rataj et al	1994	800	$\leq$ 1 mg% >2.5 mg%	2.4%      89%
Suchonska B et al <sup>29</sup>	2004	-	< 1 mg%	0%
Bernaldo et al	2004	380	$\geq$ 2 mg	53%
Amar T et al <sup>25</sup>	2005	200	>2 mg/dl	9.5%
Knupfer et al	2005	1100	< 1.17 1.17 - 1.75 1.75 - 2.34 >2.34	0%      0.30% 3.4%      8.6%
Present study	2012	113	< 3 mg > 3 mg	0%      3.3%

Other studies also reported the relation between raising levels of cord bilirubin and increased incidence of significant hyperbilirubinemia in later life. In ABO or non-ABO situation raised cord blood bilirubin indicates ongoing hemolysis while in mothers womb. These babies are more likely to develop Hyperbilirubinemia.

**TABLE NO.3-Studies on the predictive ability of cord blood bilirubin level and the neonatal hyperbilirubinemia**

Studies	Cut off Cord STB (mg/dl)	Cut off Neonatal Hyperbilirubinemia (mg/dl)	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
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Amar Taksande et al (2005)	>2	$\geq$ 17	89.5%	85%	38.8%	98.7%
Knudsen (1989)	>2.35	>15	13%	99%	85%	72%
Zakia Nahar et al <sup>30</sup> (2009)	$\geq$ 2.5	$\geq$ 17	77%	98.6%		96%
Sun et al (2007)	>2	$\geq$ 17	68%		45.08%	
Rudry Satrya et al (2009)	$\geq$ 2.54	$\geq$ 12.9	90.5%	85%		
Present (2012)	$\geq$ 3	$\geq$ 15	100%	98.17%	66.67%	100%

In the present study using serum bilirubin levels  $\geq$  3 mg/dL in the cord blood, hyperbilirubinemia could be predicted with sensitivity of 100%, specificity of 98.17 %, and positive predictive value of 66.67 % and Negative predictive value of 100%.

**CONCLUSION:**

In postnatal wards hyperbilirubinemia is one of the common problems seen. Neonatal hyperbilirubinemia occurs in 5-10% of healthy term infants. Up to 4% of term newborns who are readmitted to the hospital during their first week of life, approximately 85% are readmitted for jaundice.

A 100% Negative Predictive Value in the present study suggests that in healthy term babies (without RH and ABO incompatibility with Cord Blood Bilirubin < 3 mg/dl ) cord serum bilirubin can help to identify those newborns who are unlikely to require further evaluation and intervention. Babies with Cord Blood Bilirubin level  $\geq$  3 mg/dl should be followed more frequently to reduce morbidity and mortality due to neonatal hyperbilirubinemia.

Our study sample did not have a heterogeneous group of neonates. This is the strength of our study. It means that the Prediction test (48 hrs TSB  $\geq$ 15 mg/dl) developed by us can be applied to the neonates of local rural population on whom it was developed. Thus prediction of neonatal hyperbilirubinemia will have widespread implication especially in our rural setup.

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