ORIGINAL ARTICLE

# Cord Blood Albumin as a Predictor of Significant Hyperbilirubinemia in Term Neonates

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**ABSTRACT**

**Objective:** To determine the frequency of jaundice at a cut off level of ≤2.8 gm/dL of the cord blood albumin in full term babies.

**Study Design:** Descriptive case series study.

**Place and Duration of Study:** This Research was done in Pediatric Department, Holy Family Hospital, Rawalpindi from 27th July 2013 to 27th January 2014.

**Materials and Methods:** Seventy term neonates, delivered by any mode of delivery and normal birth weights were included. Cord blood albumin level was sent. Neonates were divided into two groups. Group I was having cord blood albumin levels equal to or less than 2.8gm/dl and group II had level above 2.8gm/dl. They were followed in OPD at 72 hrs of life for development of jaundice. Jaundice was assessed clinically by Kramer dermal zones method and confirmed by serum total bilirubin level estimation. All information was recorded in predesigned proforma. Data was analyzed by using SPSS Version 23. Chi square was used to calculate frequency of jaundice in two groups of neonates.

**Results:** Mean cord blood albumin level was 3.23±0.86 gm/dL. Frequency of jaundice was significantly high in group I-71.9% versus 15.8% in group II (p=0.0005). Stratification analysis was performed with respect to gender for frequency of jaundice. It was again significantly high in group I compared to group II, irrespective of sex. (p=.001 and.002 respectively).

**Conclusion:** It is concluded that full term babies having cord blood albumin level ≤2.8 gm/dL are at risk to develop neonatal jaundice.

**Key Words:** *Albumin, Cord blood, Jaundice Neonatal.*

## Introduction

Jaundice is the visible manifestation in skin and sclera of elevated serum bilirubin. Neonatal jaundice may not appear until serum bilirubin exceeds 5 to 7 mg/dL. Significant neonatal jaundice means any level of bilirubin requiring intervention like phototherapy and exchange transfusion.[1]

Jaundice is observed during the first week of life in approximately 60% of term and 80% of preterm neonates.[2] A study in West Indies showed the incidence of clinically significant jaundice in this age, as 4.6%.[3]

Nearly 8% to 11% of neonates develop hyperbilirubinemia.[4] It is one of the commonest cause of admission in neonatal units worldwide.

Bilirubin is produced in reticuloendothelial system as the end product of heme catabolism. Biliverdin is formed from heme and is reduced to water insoluble bilirubin. It is then transported bound to albumin to the liver.[5]

A study done in Karachi reported that neonatal jaundice was the third common cause, accounting for 13.5% of all neonatal admissions.[6]

Extreme neonatal hyperbilirubinemia has long been known to cause the clinical syndrome of kernicterus, or chronic bilirubin encephalopathy (CBE). Kernicterus is commonly characterized by choreoathetoid cerebral palsy (CP), impaired upward gaze, and sensorineural hearing loss, whereas cognition is relatively spared. The chronic condition of kernicterus may be, but is not always, preceeded in the acute stage by acute bilirubin encephalopathy (ABE). This acute neonatal condition is also due to hyperbilirubinemia, and is characterized by lethargy and abnormal behavior, evolving to frank neonatal encephalopathy, opisthotonus, and seizures.[7]

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*Funding Source: NIL; Conflict of Interest: NIL*
*Received: March 04, 2019; Revised: November 26, 2019*
*Accepted: December 27, 2019*

It is already established from literature, that low levels of serum albumin at the time of birth are a predictor of significant hyperbilirubinemia. The early prediction of jaundice can help in timely intervention and reduction in morbidity and mortality associated with hyperbilirubinemia. In our country less work has been done on this subject. The aim of our study was to determine the frequency of jaundice at a cut off level of ≤2.8 g/dL of cord blood albumin in full term babies.

## Materials and Methods

This descriptive Case Series study was done in Pediatric department, Holy Family Hospital (HFH) Rawalpindi from 27th July 2013 to 27th January 2014. Seventy neonates delivered in Holy Family Hospital, were included by using consecutive sampling technique.

After approval from hospital ethical committee and informed consent from each parent, 2 ml of cord blood was taken for serum albumin and sent to the laboratory.

Term neonates with gestational age between 37 to 42 weeks, born by any mode of delivery, of both genders and normal birth weights were included. Prematurity, Rh, or ABO incompatibility, already admitted patients and those having CRP >6 were excluded from the study.

On the basis of cord blood albumin levels, neonates were divided into two groups, one having cord blood albumin less than or equal to 2.8gm/dL(Group I) and the other having cord blood albumin more than 2.8gm/dL (Group II). They were followed in OPD at 72 hrs of life for development of jaundice. Jaundice was assessed clinically by Kramer dermal zones method and confirmed by serum total bilirubin level estimation. Neonates were assessed for the need of phototherapy/exchange transfusion.

Data was analyzed by using SPSS Version 23. For qualitative variables like gender and jaundice, frequency and percentages were calculated. Chi square was used to calculate frequency of jaundice in two groups of neonates. *p* value less than 0.5 was significant.

Quantitative variable, albumin level was represented as mean and standard deviation. Stratification was done with respect to gender and observed effect on outcome.

## Results

Out of 70 neonates, 44(62.86%) were male and 26(37.14%) were female. Spontaneous vaginal delivery (SVD) was the mode of delivery of 49 (70%) and 21(30%) were born by Lower Segment Caesarean Section (LSCS). The neonates were divided into two groups on the basis of cord blood albumin level. They were followed in OPD at 72 hrs of life for development of jaundice. Clinically jaundice was observed in 29 (41.43%) neonates at 72 hours of life.

Mean serum albumin level was 3.23±0.86 gm/dl (2-5.8 gm/dL) as shown in (Table I). There were 32(45.71%) neonates in group I and 38(54.29%) in group II. Comparison of frequency of jaundice among neonates in two groups of cord blood albumin is shown in (Table II). It was significantly high in group I [71.9% (23/32) versus 15.8% (6/38)] as compared to group II (p=0.0005).

Stratification analysis was performed with respect to gender for frequency of jaundice. It was again significantly high in group I in both male and female neonates. [p=.001 and.002 respectively (Table III)].

**Table I: Mean Serum Albumin Level in Full Term Neonates**

| Statistics | | Serum Albumin Level (gm/dl) |
|---|---|---|
| Mean | | 3.23 |
| Std. Deviation | | 0.86 |
| 95% Confidence Interval for Mean | Lower Bound | 3.03 |
| | Upper Bound | 3.44 |
| Minimum | | 2.0 |
| Maximum | | 5.8 |

**Table II: Comparison of Frequency of Jaundice in Group I &II on Basis of Cord Blood Serum Albumin. (N = 70)**

| Cord blood Albumin levels | Frequency Of Neonates with Jaundice at 72 Hours | Total | P-Value |
|---|---|---|---|
| ≤ 2.8 gm/dl Group I | 23(71.9%) | 32 | 0.0005 |
| >2.8 gm/dl Group II | 6(15.8%) | 38 | |

SPSS Version 23 (Chi-Square test = 22.51)

**Table III: Comparison of Frequency of Jaundice in Male and Female Neonates in Group I and II**

| Cord Blood | Jaundice at 72 hours | | P-Value |
|---|---|---|---|
| Albumin levels | MALE | FEMALE | |
| ≤ 2.8 gm/dl Group I | 12(66.7%) | 11(78.6%) | 0.001 (M) |
| >2.8 gm/dl Group II | 4(15.4%) | 2(16.7%) | 0.002 (F) |
| Total | 16 | 13 | |

SPSS Version 23 [Chi-Square test = 12.088 (M), 9.905(F)]

## Discussion

In the present study, we assessed the ability of cord blood albumin as a predictor of significant hyperbilirubinemia in neonates. Out of 70 babies 32 were in group I and 38 in group II. Frequency of jaundice was significantly high in group I (71.9%) as compared to group II (15.8%). Sex and mode of delivery had no significant correlation with hyperbilirubinemia.

Jaundice is a common clinical condition and constitutes one of the major causes of morbidity during the neonatal period.[8] Neonatal hyperbilirubinemia (NH) needs appropriate and timely treatment, no matter whether it arises from physiological or pathological causes.[9] Physical examination is not a reliable measure of the blood level of serum bilirubin. The concept of prediction of jaundice offers an attractive option to pick neonates at risk of significant neonatal hyperbilirubinemia. In these situations, it would be desirable, to implement early treatment and thereby minimize the risk of bilirubin dependent brain damage.[10]

Maisels and Kring showed that male sex has more risk of readmission for neonatal hyperbilirubinemia. It could be explained on the basis that in developing countries male children are given more care in comparison to the females, because of the gender discrimination prevalent in the society.[11] Our study resembles the study done by Taksande et al, which also states that there is no relation between neonatal hyperbilirubinemia and the sex of the baby.[12]

In this study 70% neonates were delivered by SVD and 30% were born by LSCS. Taksande et al and Aiyappa's studies state that there is no significant association between the mode of delivery and neonatal hyperbilirubinemia, as is seen in our study.[10,12]

In our study, frequency of jaundice in neonates was 41.43% at 72 hours of life. In Trivedi et al's study, it was 33.88%, who followed full term neonates till seventh day of life.[13]

In our study, frequency of jaundice was significantly high in group I- 71.9% versus group II-15.8%. ($p<0.0005$).

Aiyappa also divided neonates into two groups, based on cord blood serum albumin, but those with serum albumin level >than 2.8gm/dL were labelled as group I, different from our group I. In his study 126 babies were under Group 1 and 39 under Group 2. Jaundice was observed in 34% of neonates from group I and in 71.7% from group II. The total bilirubin levels were significant in Group II, ($p<0.001$) [12]. This was consistent with our study.

In Trividi et al's and Reshad M et al studies, cord blood albumin ≤ 2.8gm/dL, like in our study was also a risk indicator in predicting neonatal hyperbilirubinemia.[13,14]

In studies of Choudhary RE, Meena KJ and Mishra AK, neonates were divided into 3 groups based on serum levels of <2.8g/dL, 2.8-3.3gm/dL and >3.3gm/dL. In these studies it was found that most of the neonates with albumin less than 2.8 gm/dL developed jaundice within 72 hrs after birth, which was again similar to our study.[15,16,17] In these studies it was concluded that it is probably safe to discharge neonates with levels more than 3.3gm/dl.

Neeraj Rajpurohit et al, in their study found that cord blood serum albumin ≤ 2.6 gm/dL was associated with increased risk of neonatal hyperbilirubinemia[18]. They also took cord serum bilirubin and found it more sensitive than cord serum albumin in predicting significant neonatal hyperbilirubinaemia. Cord blood serum bilirubin was not taken in our study.

Bhat JA and Khairy MA in their studies found cord blood albumin as a better and early, indicator of hyperbilirubinemia compared to cord blood bilirubin and bilirubin/albumin ratio. Neonates with cord blood albumin < 2.4g/dl and ≤3 g/dl were at risk in their studies respectively.[19,20] Neonatal hyper bilirubinemia remains the most common cause for readmission.[21]

By predicting the newborns, who are likely to develop significant neonatal jaundice early, we can effectively design and implement the follow-up plan.

Neonatal hyper bilirubinemia is a cause of concern for the parents as well as the pediatricians. Early discharge of healthy term newborns after delivery has become a common practice because of medical and social reasons and economic constraints.

As far as the limitations of our study are concerned, we could have followed the neonates longer, and measured both cord blood bilirubin and albumin levels. So, future studies are suggested comparing cord blood albumin with cord blood bilirubin.

## Conclusion

It is concluded from our study that full term babies having cord blood albumin level ≤2.8 gm/dL are at risk of developing significant hyperbilirubinemia. Cord blood albumin can be used as a predictor for hyperbilirubinemia, and for early review of jaundice especially in developing countries, where regular follow up is difficult.

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