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Evaluation of the cord blood albumin for the early prediction of neonatal jaundice

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Abstract
Background and Aim: Neonatal Hyperbilirubinemia (NH) is the most common cause for readmission during the early neonatal period. There are reports of bilirubin induced brain damage occurred in healthy term infants even without haemolysis and the sequalae could be serious. Aim of the study was to predict the development of Neonatal Hyperbilirubinemia at birth using Cord Serum Albumin as a risk indicator.
Material and Methods: Observation study was performed on 348 healthy term new-borns. Cord blood was collected from the healthy term new-borns delivered either vaginally or caesarean section for cord serum albumin level measurements. Total serum bilirubin and direct serum bilirubin were measured during 72-96 hours of life with serum sampling of peripheral venous blood. Newburn was assessed clinically daily for Neonatal Hyperbilirubinemia or for any other complication during the study period.
Results: Study cohort is grouped into Group1, Group2 and Group 3 based on Cord Serum Albumin level ≤ 2.8g/dl, 2.9-3.3g/dl and ≥ 3.4g/dl, respectively. In these groups, new-borns with total serum bilirubin level ≥17mg/dl after 72 hours are taken as Neonatal Hyperbilirubinemia, requiring interventions like phototherapy or exchange transfusion.
Conclusion: There is a correlation between Cord serum albumin level and neonatal hyperbilirubinemia in healthy term new-borns. Cord serum albumin level of ≤2.8 g/dl can predict the development of neonatal hyperbilirubinemia.

Keywords: Cord serum albumin, neonatal hyperbilirubinemia, prediction and new-borns

Introduction

Jaundice is one of the commonest problems that can occur in a new born. Many a times it is physiological in the new born because liver is not mature enough to handle the bilirubin. Apart from this there is an increased load of bilirubin in neonates as they have a higher circulating erythrocyte volume, a shorter mean erythrocyte life span and a larger early labelled bilirubin peak [1].

Neonatal Hyperbilirubinemia (NH) is commonest abnormal physical finding during the first week of life. Over two third of new born babies develop clinical jaundice. NH affects nearly 60% of term and 80% of preterm neonates during first week of life. 6.1% of well term new born have a serum bilirubin over 12.9 mg%. Serum bilirubin over 15 mg% is found in 3% of normal term new-borns. Neonatal Hyperbilirubinemia (NH) is a cause of concern for the parents as well as for the paediatricians [2].

Physiological hyperbilirubinemia results from immature liver cell having very low Uridine Diphospho-Glucuronosyl Transferase activity compared to mature hepatocyte, low concentration of Bilirubin binding ligand Albumin, and higher volume of short life erythrocytes in the circulation. Physiological jaundice arises as a "normal" response to the baby's limited ability to excrete bilirubin in the first days of life. Every newborn develops unconjugated hyperbilirubinemia due to increased level of unconjugated Bilirubin above 1.0mg/dl [3, 4].

NH recognition, follow-up, early treatment and prevention of bilirubin induced encephalopathy has become more difficult as a result of earlier discharge from the hospital. The treatment of severe NH by exchange transfusion is costly. It is associated with complications, time consuming and requires skilled manpower [5]. Early treatment of jaundice with phototherapy is effective, simple and cheap. Developing countries like India must be fully aware of this limitation on the development of neonatal care, particularly neonatal intensive care [6].

The ultimate aim should be to benefit maximum number of new-born babies with cost effective treatment protocol. The present study is conducted to find out critical value of Cord Serum albumin in predicting the subsequent development of significant neonatal hyperbilirubinemia requiring interventions like phototherapy or exchange transfusion.

Material and Methods

The present study was conducted in the medical college. Total of 348 randomly selected in eligible neonates delivered at the medical hospital. The study was approved by the ethical committee of the institute.

Inclusion criteria includes: both gender term babies, birth weight > 2.5 kg, APGAR > 7/10 at 1 min. Preterm babies, Rh incompability, presence od neonatal sepsis, instrumental delivery and presence of respiratory distress were excluded from the study.

An informed consent was obtained from the parents of the new-born before enrolling them in the study. Demographic profile and relevant information was collected by using structured Proforma by interviewing the mother and from mother's case sheet. Gestational age was assessed by New Ballard score (if LMP not sure). Cord Serum Albumin level was estimated at birth. Total Serum Bilirubin (TSB) estimation was done at 72-96 hours of age. All the babies were followed up daily for first 4 postnatal days and babies were daily assessed for NH and its severity.

Cord blood (2 ml) was collected from placental side after its separation and subjected to investigation of Cord Serum Albumin level. Venous blood samples were collected from the baby at 72 to 96 hours of life. These samples were subjected to following investigation: Total and Direct Serum Bilirubin and Blood group analysis. Cord blood collected at birth will be analyzed by auto analyzer method (Erba EM 200) for Cord Serum Albumin estimation. Venous blood sample collected was stored away from light. The sample was refrigerated between 2 -8 degree C till serum bilirubin estimation is done. Serum 45 bilirubin estimation was done within 12 hours of collection of sample by Diazotized sulfanilic test. Serum bilirubin ≥17 mg/dl after 72 hours of life was taken as hyperbilirubinemia and treatment is advised, as per the American academy of pediatrics practice parameter, 2004.

Results

The study was conducted on total of 348 new-borns after obtaining a written consent from the parents. Proforma was filled for each new born. The gender distribution of new born in the study group; 196 were male and 152 were female new-borns. Majority of the new-born in the study group were delivered by vaginal route. Maternal weight document in last trimester or just before delivery was collected from case sheet. Maternal weight in the study group is concentrated between 60-70kg (43.7%) and 70-80kg (32.8%).

This table 1 shows the distribution of study cohort into groups based on cord albumin level measured at birth. Group 1 consists of 162 newborns constituting to 46.6% of the study cohort. Whereas Group 2 consists of 106 new-borns (30.5%) and Group 3 consists of 80 new-borns (23%) of study cohort.

Table 1: Cord serum albumin levels in the study groups.

Cord serum albumin (g/dl)	No. of patients
<2.8	162
2.9 – 3.3	106
>3.4	80
Total	348

Table 2: Distribution of total serum bilirubin of neonatal

Total serum bilirubin	No. of patients
< 10	14
10 – 14	266
15 – 17	28
> 17	40
Total	348

Discussion

Neonatal hyperbilirubinemia is one of the most common causes for readmission of the new-borns [7]. The need for early detection of hyperbilirubinemia in the early discharged new-borns from the hospital is therefore important. Knowledge of the neonates at risk for developing jaundice allows simple bilirubin reducing methods to be implemented before bilirubin reaches critical levels [8].

There is concern regarding early discharge of healthy term new-borns due to reports of bilirubin induced brain damage resulting in sequalae like kernicterus. Kernicteus is the chronic sequelae of acute bilirubin encephalopathy. Incidence of kernicterus is unknown [9]. Hence defining a certain bilirubin level as physiological can be misleading and potentially dangerous. Neonatal hyperbilirubinemia is a potentially correctable and kerniterus is preventable.

Trivedi *et al.* [10] 2013 showed, gender wise male babies have shown higher incidence of developing hyperbilirubinemia than female babies. In the present study, study group is uniformly distributed with 98 male and 76 female babies. There is no significant correlation (p 0.89) in the TSB levels and the sex of the new-born. Hence the present study infers that the neonatal hyperbilirubinemia (≥ 17mg/dl) is independent of the sex of the new-born.

Incidence of hyperbilirubinemia varies from 8.3% to 12.8% in above mentioned studies. Incidence of hyperbilirubinemia in the present study is 11.5% which correlates with most of the above studies mentioned. Sahu *et al* [1] study, 2011, showed that 70% new born who developed significant NH had cord serum albumin level < 2.8 g/dl, 30% new born had CSA level 2.9-3.3 g/dl and none of new-borns with CSA level > 3.4g/dl developed NH. There is Statistical significance noted between CSA with development of NH (p value < 0.05).

In the present study, 348 new-born included and 40 new-born developed NH. The study cohort are grouped into Group 1, Group 2, Group 3, based on cord Serum Albumin level ≤ 2.8g/dl, 2.9-3.3g/dl and ≥ 3.4g/dl respectively. In group 1, 95%; Group 2, 5% and Group 3, % developed NH requiring PT. The present study results correlated well with Shau *et al* and Trivedi *et al* study. Thus CSA level appears risk indicator in predicting neonatal hyperbilirubinemia. Hence this study indicates that CSA level ≤ 2.8g/dl is high risk factor for future development of NH and CSA level ≥ 3.4g/dl is probably safe for early discharge.

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