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Cord Blood Albumin as A Predictor of Neonatal Jaundice

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Abstract

Jaundice is one of the commonest problems that can occur in a newborn. Many a times it is physiological in the newborn because liver is not mature enough to handle the bilirubin and there is an increased load of bilirubin due to a higher circulating erythrocyte volume, a shorter erythrocyte life span and a larger early labeled bilirubin peak. Early prediction will help in early discharge and prevent hospitalization of babies and mothers. Albumin is synthesized by liver and it helps in transport of unconjugated bilirubin. Forty newborns were inductedintothe study with the following inclusion criteria: sequentially born term babies (gestational age > 37 weeks) from any mode of delivery, both genders, any birth weight, APGAR score of more than 7 at first and fifth minutes of life, and without Rh incompatibility between mother and child. They were estimated for cord blood serum albumin. Wherever necessary further laboratory tests were done for bilirubin and managed accordingly. Our study showed that 82 % of neonates who had albumin levels less than 2.8 gm/dl developed hyperbilirubinemia requiring phototherapy(PT) and about 12% needed exchange transfusion. At higher levels of albumin that is 2.8 - 3.3 gm/dl, 40% needed PT and with cord blood albumin > 3.3 gm/dl did not need any intervention for hyperbilirubinemia. Hence we can conclude that cord blood albumin levels more than 3.3 gm/dl is probably safe for early discharge of baby. Umbilical cord albumin levels are useful in predicting the development of jaundice in healthy terminfants.

E-mail: Jaundice; Umbilical cord albumin; Phototherapy.

Introduction

Jaundice is one of the commonest problems that can occur in a newborn. Many a times it is physiological in the newborn because liver is not mature enough to handle the bilirubin. The neonates have about 1% of uridine diphosphoglucuronosyl transferase (UDPGT) activity as that of an adult [1]. 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 labeled bilirubin peak [2]. This hyperbilirubinemia is due to uncojugated bilirubin which is toxic to central nervous system. More than two thirds of all newborns appear jaundiced clinically because at some point during the first week of life almost every newborn has a total serum bilirubin (TSB) level of > 1 mg/dl, the upper limit of normal for an adult. There are significant differences in TSB levels in different populations and it is difficult to define as normal or abnormal or obtain diagnostic and therapeutic cut off levels [3]. Defining a certain bilirubin level as physiological can be misleading and potentially dangerous. It is difficult to predict the course of bilirubinemia on day one of a neonate. There have been reports of cord blood bilirubin as predictor of hyperbilirubinemia that would require phototherapy (PT) [4, 5]. Early prediction will help in early discharge and prevent unnecessary hospitalization of babies and mothers. Albumin is

synthesized by liver and it helps in transport of unconjugated bilirubin. There is paucity of reports on serum albumin or cord blood albumin levels as a predictor of hyperbilirubinemia. Keeping the aforesaid in mind we studied umbilical cord serum albumin levels and followed the babies for hyperbilirubinemia and those requiring PT.

Methods

This study was conducted in the departments of Pediatrics and Biochemistry at our Institute. Participants: Forty newborns were inducted into the study with the following *inclusion* criteria: sequentially born term babies (gestational age > 37 weeks) from any mode of delivery both genders, any birth weight, APGAR score of more than 7 at first and fifth minutes of life, without Rh incompatibility between mother and child. The exclusion criteria were preterm babies (gestational age < 37 weeks), neonatal sepsis and any complications arising during the hospital stay.

Biochemicalinvestigations

With the informed consent of the parents 2 ml of cord blood was collected from newborns and serum separated. They were estimated for serum albumin by BCG method [6] using Dade Behring, UK. From then on the newborns were followed up clinically for jaundice according to the evaluation of the Kramer dermal zones [7]. Wherever necessary further laboratory tests were done for bilirubin and managed accordingly.

Statistical Analysis

The qualitative variables were represented as absolute (n) and relative (%) frequency values?Quantitative variables were representedas meanand standard deviation?Correlation between birth weight and cord blood albumin was obtained using Pearson's correlation

Results

The lower limit of normal for serum albumin in term babies is 2.8 gm/dl at birth [8]. We grouped our subjects according to their cord blood albumin levels upto 2.8 gm/dl, 2.8 - 3.3 and > 3.3 gm/dl. Table 1 shows the general characteristics of all the participants. 82.35% of babies with cord blood albumin < 2.8 gm/dl developed hyperbilirubinemia, all of them requiring phototherapy and 2 of them (11.8%) requiring exchange transfusion. The group with cord blood albumin between 2.8 - 3.3 gm/dl had a lesser incidence that is 40% babies developed hyperbilirubinemia and they were all treated with PT. Whereas none of the babies with cord blood albumin > 3.3 gm/dl developed hyperbilirubinemia requiring any intervention. Table 2 shows that the Pearson's correlation 'r' between birth weight and cord blood albumin. It was positive in the lower group that is < 2.8 and 2.8 - 3.3 gm/dl and was negative when albumin levels were > 3.3gm/dl. However, none of them were statistically significant. ANOVA done of cord blood albumin levels between groups and

Table 1: General characteristics of participants

	< 2.8 gm/dl	2.8 - 3.3 g/dl	> 3.3 gm/dl
Number of neonates (n)	17	15	8
Neonates developing hyperbilirubinemia (%)	14 (82.35 %)	6 (40 %)	0
Number of newborns requiring phototherapy(%)	14 (82.35 %)	6 (40 %)	0
Number of newborns requiring exchange transfusion (%)	2 (11.8%)	0	0
Weight in kg (mean ± SD)	2.87± 0.48	2.97± 0.36	3.12± 0.27
Cord blood albumin in gm/dl (mean ± SD)	2.49± 0.19	3.2 ± 0.1	3.6± 0.19

Table 2: Pearsons correlation (r) between weight of neonate and cord blood albumin

Cord blood albumin (gm/dl)	r	P
< 2.8	0.04	NS
2.8-3.3	0.24	NS
>3.3	-0.3	NS

within groups showed significant differences (p= 0.000) whereas the difference for birth weight was not statistically significant (p= 0.541).

Discussion

Albumin is the major binding protein in the human neonate. Low production of albumin will lower itstransport and binding capacity [9]. Albumin binds to potentially toxic products likebilirubin and antibiotics. Bilirubinbinds to albumin in an equimolar atio. Free bilirubin is anticipated when themolar bilirubin- to- albumin (B: A) ratio is >0.8. It is the free bilirubin which cancross the blood brain barrier. There are no ecise data to corr a specific bilirubin value or albumin value wit neurotoxicity. The clinical manifestations of acute bilirubin encephalopathy can be insidious and progress rapidly to severe and life threatening illness. Kernicterus is the chronic sequelae of acute bilirubin encephalopathy. The incidence of kernicterus is unknown [10]. Unconjugated hyperbilirubinemia is a potentially correctable cause and kernicterus is preventable[11]. The decision to treat hyperbilirubinemia is based on the infants history course, physical findings serum bilirubin levels and risk benefit analysis [12] Our study showed that 82 % of neonates who had albumin levels less than 2.8 gm/dl developed hyperbilirubinemia requiring PT and about 12% needed exchange transfusion. At higher levels of albumin that is 2.8 - 3.3 gm/dl 40% needed PT and neonates with cord blood albumin > 3.3 gm/dl did not need any intervention for hyperbilirubinemia. Hence we can conclude that cord blood albumin levels more than 3.3 gm/dl is probably safe for early discharge of baby. Similar work have been reportedusing cord blood bilirubin [4, 5, 13] and umbilical cord haptoglobin [14].

Conclusion

Umbilical cord albumin levels are useful in predicting the development of jaundice in healthy term infants. It will help detect infants at low or high risk for hyperbilirubinemia. This will minimize hospitalization and prevent readmission of infants with jaundice.

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