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RESEARCH ARTICLE

CORD BLOOD TOTAL PROTEIN, ALBUMIN AND BILIRUBIN LEVELS AND THEIR RELATION WITH THE ONSET AND SEVERITY OF NEONATAL JAUNDICE

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ABSTRACT

Hemolysis following birth is a normal way of replacing fetal haemoglobin with adult haemoglobin. It is a physiological mechanism. Albumin is the carrier of bilirubin in the blood to the Liver. Hypoalbuminemia leads to lesser availability of albumin to carry Bilirubin thereby increasing the hyperbilirubinemia and increasing chances of Kernicterus. Our study proposes to study the correlation between cord blood Total protein and Albumin levels and the time of onset and the severity of jaundice. 50 term neonates were taken up for the study. Cord blood sample was collected and estimation of bilirubin, total protein and albumin was done. Follow up was done to observe the development of clinical jaundice and its severity. Significant association has been found between cord blood albumin, total protein and bilirubin levels and the tendency to develop neonatal hyperbilirubinemia

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INTRODUCTION

Neonatal Hyperbilirubinemia is one of the commonest abnormalities affecting neonates. Extreme high levels of unconjugated bilirubin may lead to neurological complication called kernicterus which is a fatal condition. Our study was proposed to study the correlation between cord blood Albumin levels and the time of onset of jaundice and the severity of the jaundice. The knowledge of the Albumin bilirubin relationship can help the newborn to be identified as susceptible to jaundice and kernicterus and hence early treatment can be initiated. If cord blood albumin levels can predict the development of jaundice and its severity, neonates at high risk of developing jaundice can be given early treatment and prevent development of kernicterus.

MATERIALS AND METHODS

The present study was conducted at Department of Clinical Biochemistry, GCS Medical College, Hospital and Research Center, Ahmedabad. The study was approved by the institutional Ethics Committee. This study included 50 term neonates born to pregnant women within 20-35 years of age with singleton pregnancy. Those with diabetes mellitus, hypertension, chronic diseases or those who were unwilling to be to a part of the study were excluded. Infants with umbilical cord abnormalities or any other congenital anomaly were excluded. Sample collection was done after the placenta had been delivered and the umbilical cord had been clamped and cut after delivery. The placenta with the cord clamped was kept in a tray with the umbilical cord hanging freely over the edge. Blood is collected in a sample collection tube. All estimations were done in Autoanalyser Erba XL640 in the Biochemistry division of the Central Clinical Laboratory, GCSMC, Ahmedabad.

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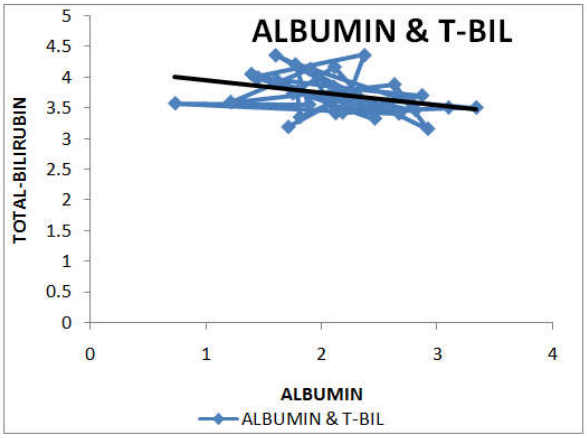
RESULTS

This is a prospective study carried out in GCS Medical College & Hospital, Ahmedabad. The study included 50 term neonates. Age & sex related difference in bilirubin levels were not found to be of significance. No significant association was found

between the birth weight of the newborn babies and the development of significant Neonatal Hyperbilirubinemia. Also, no significant association was found between religion, geographical area, birth weight, parity of mother, mode of delivery, time of initiation of breast feeding with onset and severity of neonatal hyperbilirubinemia. Sample collection was followed by estimations of cord blood total protein, albumin and bilirubin levels. Data was tabulated in Microsoft Excel and analysed using IBM SPSS 20.0 and Microsoft Excel 2007. Paired Sample t-test was used to test the significance (or analyse the data) between the groups

- Total Bilirubin and Total protein
- Direct Bilirubin and total protein
- Indirect Bilirubin and total protein
- Total Bilirubin and Albumin
- Direct Bilirubin and Albumin
- Indirect Bilirubin and Albumin

P value less than 0.05 was considered significant.



Correlation between Total Bilirubin & Albumin is negative and highly significant ($p<0.0001$).

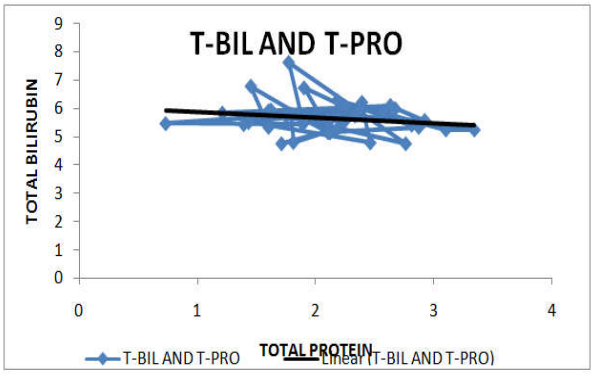
Only Correlation between Direct Bilirubin and that of Albumin is POSITIVE while that of correlation between T BIL, D BIL, I BIL with Total Protein is NEGATIVE and T BIL, I BIL with Total Albumin is also NEGATIVE. Differences between the Total Bilirubin (or Bilirubin levels) with that of Total Protein is Statistically Significant. Also correlation of Total Bilirubin (or Bilirubin levels (Direct, indirect, total)) with that of Albumin is also Statistically Significant.

Paired Samples T-Test

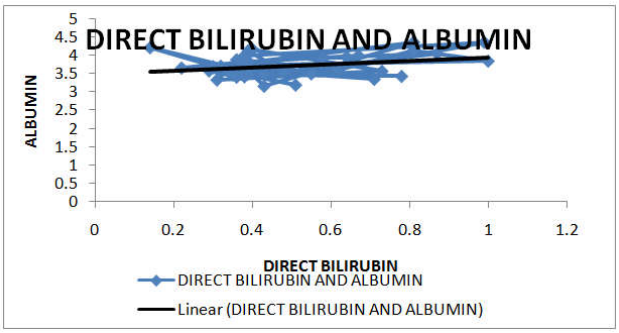
Sr. No.	Pairs	Paired Differences Mean	Std. Deviation	Correlation	P-value
Pair 1	T BIL - T PRO	-3.53763	.87746	-.182	.000
Pair 2	D BIL - T PRO	-5.15789	.62587	-.012	.000
Pair 3	I BIL - T PRO	-4.02658	.92905	-.155	.000
Pair 4	T BIL - ALB	-1.61263	.72940	-.362	.000
Pair 5	D BIL - ALB	-3.23289	.32023	.306	.000
Pair 6	I BIL - ALB	-2.10158	.81711	-.415	.000

From the table

- Differences in cord blood bilirubin levels with the total protein were statistically significant ($p<0.001$).
- Statistical significance can be seen between cord serum albumin and neonatal hyperbilirubinemia (P= 0.001)



Correlation between Total Bilirubin & Total Protein is negative and highly significant ($p<0.0001$)



Correlation between Direct Bilirubin & Albumin is positive and highly significant ($p<0.0001$)

DISCUSSION

Liver is the major site for protein synthesis also for conjugation of bilirubin. Metabolic function of liver in neonates is not well developed as compared to that of adults. As a result, there is decreased synthesis of proteins in the neonates. Moreover, liver may be unable to conjugate bilirubin if it is present in excess. In the present study, we assessed the Cord blood Albumin (CSA) level as a screening tool for predicting the risk of subsequent hyperbilirubinemia. The main outcome of the study was inferred in terms of neonatal hyperbilirubinemia requiring interventions like phototherapy and exchange transfusion. In the present study, positive correlation was found between Direct Bilirubin and that of Albumin, whereas negative correlation was found between T BIL, D BIL, I BIL with Total Protein. Correlation of T BIL, I BIL with Total Albumin is also negative. All correlations were statistically significant. A study done by Suchanda Sahu et al., showed the prediction of significant hyperbilirubinemia by measuring cord blood albumin. The optimum cut-off level for prediction of neonatal jaundice using umbilical cord blood bilirubin was 2.0mg/dl; hyperbilirubinemia requiring intervention can be predicted by 96.25% clinical sensitivity. Rataj et al., reported that if cord bilirubin was less than 1mg%, the jaundice occurred in 2.4% newborns, where as 89% of the infants with cord bilirubin above 2.5mg% became jaundiced.

Seidman et al., found that the risk of significant hyperbilirubinemia was 1.6% in cases whose bilirubin level was <5mg/dL at 24 hours of life, whereas that risk was 6.6% in cases whose bilirubin level was 5mg/dL at 24 hours of life. Study of Sahu et al in 2011, showed that 70% newborn who developed significant neonatal hyperbilirubinemia had Cord blood albumin level <2.8 g/dL, 30% newborn had Cord blood albumin level 2.9-3.3 g/dL and none of the newborns with Cord blood albumin level >3.4g/dL developed NH.4 There was a Statistical significance noted between CSA and development of NH (p value <0.001). Trivedi et al in 2013, studied a total of 605 newborns and 205 newborns developed significant neonatal hyperbilirubinemia in study group with 58.35% of the neonates with Cord blood albumin level <2.8 g/dL developing significant neonatal hyperbilirubinemia (P= <0.05). Our study results correlated well with both these studies. Bernaldo and Segre in 2005 showed that the cut off point for unconjugated bilirubin in cord blood was ≥2.0mg/dl the probability that the newborn would need phototherapy was 53%. When cord blood bilirubin was 2.5mg/dl the probability needing phototherapy was 72%, when the level was 3.0mg/dl, the probability of needing treatment was 86%, and if it was 3.5mg/dl, the probability went up to 93%. This could be explained because the newborns with higher cord bilirubin level have more rapid increase in serum bilirubin and have high chances of neonatal hyperbilirubinemian and more chances of requiring phototherapy. Several studies are published on the usefulness of cord bilirubin concentration in prediction of hyperbilirubinemia. Taksande et al. showed that the cord bilirubin level >2mg/dl has a sensitivity 89.5%, specificity 85%, negative predictive value of 98.7% and positive predictive value of 38.8% in correlation with the present study.

Conclusion

It can be concluded that there is a significant association between cord blood total protein, albumin and bilirubin values and the tendency to develop significant neonatal hyperbilirubinemia. Cord blood albumin can be used as a 'surrogate marker' for screening neonates likely to develop hyperbilirubinemia.

The evaluation of Cord blood albumin is cost effective and can be safely implemented in daily clinical practice along with other laboratory investigations for early initiation of treatment and better outcome in neonates suffering from hyperbilirubinemia.

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