

Original research article

Assessment Of The Cord Serum Albumin Level (CSA) And Predicting Neonatal Hyperbilirubinemia Based On Cord Serum Albumin Levels**Dr. Tejaswi Nandan¹, Dr. Manjul Vijay²****¹ Senior Resident, Department of Obstetrics and Gynecology, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India****² Senior Resident, Department of Paediatrics, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India****Corresponding Author: Dr. Manjul Vijay****Abstract**

Aim: assessment of the Cord Serum Albumin level (CSA) and predicting neonatal hyperbilirubinemia based on cord serum albumin levels.

Material and methods: This prospective observational study was carried out in the Department of Obstetrics and Gynecology, Anugrah Narayan Magadh Medical College and Hospital Gaya, Bihar, India for 16 months. Total 120 simultaneously born full term healthy neonates were included in this study. 3 ml of cord blood was collected at birth in a SST and was sent for estimation of cord blood albumin and TSH. On detecting the presence of icterus, Blood was sent for estimation of Total Bilirubin (TB).

Results: In the study a total of 120 babies were registered. Out of this 65 (54.17)% were female and 55 (45.83%) were male. There was no significant difference in the number of male and female babies. Depending on the cord albumin levels the babies were grouped into two: >2.8 gm/dl (Group 1) and <2.8 gm/dl (Group 2). Lower normal limit for cord serum albumin in term babies is 2.8g m/dl. There was a total of 95 babies in Group 1 and 25 babies in Group 2. The mean gestational age was among Group 1 was 39.22±1.17 weeks and Group 2 was 38.37±2.51. It was noted that babies born at a lower gestational age had a higher chance of having a low albumin value and subsequent hyperbilirubinemia (p=0.001). A significant correlation was noted between the Cord TSH and cord Albumin levels in this study. Out of 120 babies, 56 babies developed icterus. Under group 1, 37 babies developed icterus and under group 2, 19 babies developed icterus. The total bilirubin levels were significant in Group 2 (p<0.001). 26 babies of the 56 with icterus required phototherapy and it was noted that majority of these babies were from group 2 (p<0.05). In our study, the sensitivity of cord albumin to detect hyperbilirubinemia in newborn was determined and found to be 76%, while specificity was 66%. The positive predictive value was found to be 40% and the negative predictive value was found to be 89%.

Conclusion: Cord albumin levels help to determine and predict the possibility of hyperbilirubinemia among neonates. Hence this can help to identify the at-risk neonates. So, routine determination of cord albumin can be advocated to keep a track on at risk neonates.

Keywords: Cord Albumin, Hyperbilirubinemia, Icterus.

Introduction

Neonatal jaundice is a common problem. Approximately 85% of all term newborns and most preterm infants develop clinical jaundice. A total serum bilirubin level >15 mg/dl is found in 3% of normal term infants.¹ Uridine Diphosphoglucuronyl Transferase (UDPGT) is an important liver enzyme for conjugation and excretion of bilirubin which is detectable at 18-20 weeks of gestation. Adult value of this enzyme activity is demonstrable by 6-14 weeks of postnatal life.² Neonatal hyperbilirubinemia is most common abnormal physical examination

finding during the first week of life. In term babies, physiological jaundice is seen to appear between 36-72 hours of age and maximum intensity of jaundice is seen between 72-96 hours of life. Serum bilirubin doesn't exceed 15 mg/dl and jaundice disappears by 10th day of life.³ Albumin is the major binding protein in a neonate. Synthesis of albumin appears at approximately the 7th -8 th week in the human fetus. Albumin concentrations are low in a neonate (~2.5 g/dl), reaching adult levels (~3.5 g/dl) after several months. Albumin binds to potentially toxic products like bilirubin. Bilirubin binds to albumin in an equimolar ratio. One gram of albumin binds around 8.5 mg of bilirubin.⁴ Low production of albumin will lower the transport of bilirubin. Free bilirubin is anticipated when the molar bilirubin- to- albumin (B: A) ratio is >0.8. It is the free bilirubin which can cross the blood brain barrier. American academy of pediatrics recommends that newborn discharged within 48 hours should have a follow up visit after 48-72 hours to check any significant jaundice and other problems.⁴ This recommendation is difficult to follow-up in India due to limited follow up facilities in the community. These neonates may develop jaundice which may be overlooked or may have delay in recognition unless the baby is closely followed up. Concern of a neonatologist regarding earlier discharge are reports of many cases of bilirubin induced cerebral damage identified in healthy term and late preterm infants even without any risk factors. Synthesis of albumin occurs in liver and it binds to bilirubin and helps in its transport. Decreased synthesis of albumin will decrease its binding capacity and transport. Hence, identification of at-risk neonates or neonates with low cord blood albumin levels early will help to avoid the complication and sequelae associated with neonatal jaundice. Objective of the study was measuring the Cord Serum Albumin level (CSA) and predicting neonatal hyperbilirubinemia based on cord serum albumin levels.

Material and methods

This prospective observational study was carried out in the Department of Obstetrics and Gynecology, Anugrah Narayan Magadh Medical College and Hospital Gaya, Bihar, India for 16 months

Methodology

Total 120 simultaneously born full term healthy neonates were included in this study. Neonates with ABO or Rh incompatibility, Major congenital malformations, Cephalhematoma, Early onset sepsis and Preterm babies were excluded from the study. 3 ml of cord blood was collected at birth in a SST and was sent for estimation of cord blood albumin and TSH. Cord Albumin was assessed using the Biuret reaction technique using an automated analyzer. Babies were examined daily for the presence of icterus upto the 5th day following which they were discharged. On detecting the presence of icterus, Blood was sent for estimation of Total Bilirubin (TB) and the results were plotted on the chart to identify the type of intervention the baby required. The data was entered into the Performa in which the gender, gestational age, mode of delivery anthropometric measurements at birth, cord TSH, Cord albumin and total and direct bilirubin of the babies were noted. Cord blood was collected at birth and was sent for estimation of cord blood albumin and TSH. Babies were examined daily for the presence of icterus up to the day of discharge. On detecting the presence of icterus, Blood was sent for estimation of Total Bilirubin (TB) and the results were plotted on the chart to identify the type of intervention the baby required. Data was collected as per the performa after obtaining consent from the parents of the neonates. The main outcome of the study was inferred in terms of neonatal hyperbilirubinemia.

Results

In the study a total of 120 babies were registered. Out of this 65(54.17)% were female and 55(45.83%) were male. There was no significant difference in the number of male and female babies. Depending on the cord albumin levels the babies were grouped into two: >2.8 gm/dl (Group 1) and <2.8 gm/dl (Group 2). Lower normal limit for cord serum albumin in term babies is 2.8g m/dl. There was a total of 95 babies in Group 1 and 25 babies in Group 2. The mean gestational age was among Group 1 was 39.22±1.17 weeks and Group 2 was 38.37±2.51. It was noted that babies born at a lower gestational age had a higher chance of having a low albumin value and subsequent hyperbilirubinemia (p=0.001). 63 babies were born by normal vaginal delivery and 57 were born by LSCS and there was no significant difference between the babies developing icterus based on the mode of delivery. The anthropometric profile of both the groups were compared and it was noted that only the birth weight had a significant correlation with cord albumin (p<0.001) (Table 1). A significant correlation was noted between the Cord TSH and cord Albumin levels in this study (Table 2). Out of 120 babies, 56 babies developed icterus. Under group 1, 37 babies developed icterus and under group 2, 19 babies developed icterus. The total bilirubin levels were significant in Group 2 (p<0.001) (Table 3). 26 babies of the 56 with icterus required phototherapy and it was noted that majority of these babies were from group 2 (p<0.05) (Table 4). Only one baby required exchange transfusion and it belonged to group 2. In our study, the sensitivity of cord albumin to detect hyperbilirubinemia in newborn was determined and found to be 76%, while specificity was 66%. The positive predictive value was found to be 40% and the negative predictive value was found to be 89%. The accuracy rate was 69%.

Table 1: Gestational age and anthropometric data

	Group 1	Group 2	P value
Gestational age (weeks)	39.22±1.17	38.37±2.51	0.001
Birth weight kgs	3.154±0.369	2.674±0.561	<0.001
Length (cms)	47.33±3.52	47.78±2.49	0.254
Head circumfere (cms)	34.84±2.32	34.62±2.59	0.789

Table 2: Relation between cord TSH and cord albumin

	Group 1	Group 2	P value
Cord TSH (micro UL/mL)	10.57±7.22	17.12±6.39	<0.001

Table 3: Relation between cord albumin and bilirubin

	Total number	Total Bilirubin value	P value
Group 1	37 (38.95%)	11.69±3.24 (mg/dl)	<0.001
Group 2	19(76%)	15.88±3.98 (mg/dl)	
Direct bilirubin value			
Group 1		0.645±0.28 (mg/dl)	0.687
Group 2		0.678±1.89 (mg/dl)	

Table 4: Relation between cord albumin and Interventions required.

	Group 1	Group 2	P value
Neonates with Icterus	37	19	<0.0005
Newborns requiring phototherapy	11	15	<0.05

Discussion

In the present study, we assessed the ability of cord albumin in assessing and acting as a tool for screening for neonatal jaundice. Albumin in a neonate is the major binder of bilirubin and decrease the binding and transport of it.⁵ In the study a total of 120 babies were registered. Out of this 65(54.17%) were female and 55(45.83%) were male. There was no significant difference in the number of male and female babies. However, studies done by Satrya and Maisels and Kring had showed that male babies are at a higher risk of developing icterus and subsequent intervention for icterus.^{6,7} But the present study is in correlation with study done by Taksande et al which states that there is no relation between neonatal hyperbilirubinemia and the sex of the baby.⁸

In this study, it was noted that the gestational age at which the baby was born had a positive correlation with the presence of lower albumin levels. It was noted that lower the gestational age higher was the chance of the baby developing icterus.

In this study 63 babies were born by normal vaginal delivery and 57 were born by LSCS and there was no significant difference between the babies developing icterus based on the mode of delivery. This was in correlation with the studies done by Sun G et al and Sahu et al.^{9,10} When the birth weight of the neonate was considered it was seen that babies born with lower weight had a significantly higher chance of developing icterus and the babies mostly had low cord albumin levels. Whereas previous studies by Knusden et al, Awathi and Rehman had stated that there was no significant correlation between the birth weight and low cord albumin values.^{11,12}

Out of 120 babies, 56 babies developed icterus. Under group 1, 37(66.07%) babies developed icterus and under group 2, 19(33.93%) babies developed icterus. The total bilirubin levels were significant in Group 2 ($p < 0.001$). 26 babies of the 56 with icterus required phototherapy and it was noted that majority of these babies were from group 2 ($p < 0.05$). Trivedi et al, in their study involving 605 neonates had concluded that majority of the infants who required phototherapy had a cord albumin level lower than 2.8 mg/dL.¹³ Suchanda et al in a study of 40 neonates found that 80% neonates with cord albumin less than 2.8 mg/dL required phototherapy.¹⁰

In our study, the sensitivity of cord albumin to detect hyperbilirubinemia in newborn was determined and found to be 76%, while specificity was 66%. The positive predictive value was found to be 40% and the negative predictive value was found to be 89%. The accuracy rate was 69%.

Pahuja M et al in their study had noted that predictive value of cord albumin for development of neonatal hyperbilirubinemia was 75% which implies a fair predictive value of the criteria with 61.3% sensitive and 76.8% specific and is in correlation with the present study.¹⁴ A study by Nahar et al showed cord bilirubin level > 2.5 mg/dL had a sensitivity of 77%, specificity of 98.6% with negative predictive value of 96% which is in correlation with the present study.¹⁵ Sahu et al, showed that 70% newborn who developed significant Neonatal hyperbilirubinemia had cord albumin level < 2.8 gm/dL, 30% newborn had cord albumin level 2.9-3.3 gm/dL and none of the newborns with cord albumin level > 3.4 gm/dL developed hyperbilirubinemia.¹⁰

Conclusion

Cord albumin levels help to determine and predict the possibility of hyperbilirubinemia among neonates. Hence this can help to identify the at-risk neonates. So, routine determination of cord albumin can be advocated to keep a track on at risk neonates.

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