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ORIGINAL ARTICLE

TRIPLE TEST – NEWBORN SCREENING REDEFINED

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ABSTRACT: Hyperbilirubinemia is one of the common causes of admission in newborns. There is concern about an increasing incidence of hyperbilirubinemia and possibility of kernicterus even in healthy term newborns. Thus, early prediction of newborns at risk for developing significant hyperbilirubinemia may be helpful in early intervention. This study was done to find out the association between cord blood bilirubin and hyperbilirubinemia at 72 hours of life and also the association between cord Hb and Hb at sixth month of life along with screening babies for congenital hypothyroidism by TSH assay at birth. **MATERIALS AND METHODS:** 120 term healthy newborn babies delivered in a tertiary care centre (MES Medical College, Perinthalmanna), were included in this study. They were screened at birth for cord blood Hb, bilirubin and TSH values. These values were compared with bilirubin values at 72 hours of life and Hb at sixth month. Chi-square and correlation tests were used and data analyzed using Epi Info software. **RESULTS:** Our study showed a strong association between cord blood bilirubin (>2 mg/dL) and significant hyperbilirubinemia (>14 mg/dL) at 72 hours of life with a p value of 0.009. No association was found between cord Hb and Hb at sixth month. **CONCLUSION:** A cord blood bilirubin value above 2 mg/dL is a useful predictor of significant hyperbilirubinemia (>14 mg/dL) in healthy term newborns.
KEYWORDS: Hyperbilirubinemia, kernicterus, cord blood.

INTRODUCTION: Bilirubin is one of the biologically active end products of heme catabolism.[1] It can cause jaundice which is not only harmless upto a particular point but can be a useful antioxidant for the newborn baby. But beyond a certain level it may also be deposited in the brain, where it has been implicated in causing transient dysfunction and occasionally permanent neuronal damage. So it is important to detect these rare but serious sequelae of hyperbilirubinemia early so that necessary measures can be undertaken to prevent this. Measuring cord blood bilirubin may be useful to screen babies at risk for developing pathological hyperbilirubinemia.

Newborn screening for congenital hypothyroidism is routine in developed countries. It was initiated in Quebec, Canada in 1972.[2] This screening is very important because congenital thyroid deficiency results in cretinism (severe mental retardation). This effect is prevented by thyroid hormone replacement early in life. An elevated TSH (Thyroid stimulating hormone) value is the most sensitive and specific test to confirm the diagnosis of primary hypothyroidism.[3] At birth there is a sharp increase in TSH level as a result of neonatal cooling. So in some cases it might become mandatory to recheck TSH & T4 value after 48 hours to reduce false positive results.

The RBC count, Hb (Hemoglobin) concentration and hematocrit increases throughout gestation. Physiological anemia of infancy develops after 8 weeks and hemoglobin concentration reaches a nadir of about 11gm/dL. This decline is more rapid and extreme in premature infants. Anemia in infants and young children go unnoticed and many of them admitted to hospitals for other

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reasons have blood tests which indicate anemia as an incidental finding. Detecting cord blood Hb and comparing the Hb level at 6 months may be useful to find out at risk babies.

So in the present study we measure cord blood Hb, bilirubin and TSH levels and compare the results with levels at the above mentioned ages of the baby.

AIM OF THE STUDY:

1) To compare cord blood bilirubin and serum bilirubin at 72 hours of life.
2) To predict the value of cord blood bilirubin for subsequent neonatal jaundice.
3) To study the relationship between cord blood Hb and Hb at 6 months.
4) To screen newborn babies for hypothyroidism.

MATERIALS AND METHODS:

- **Study setting** - MES Medical College Hospital, Perinthalmanna. (Tertiary level health care centre in Kerala)
- **Study period** - 15/01/2011-15/01/2012
- **Methods of selection**-

Inclusion criteria: Term healthy newborn babies delivered at MES Medical College were selected irrespective of their sex, socioeconomic status and type of delivery.

Exclusion criteria:

- Preterm & post term babies.
- Babies with obvious congenital malformations.
- Babies who needed NICU admission in the first 3 days of life.
- Babies born out of multiple gestation.
- Infants of diabetic mother.
- Babies with family h/o haemolytic disorders.

- **Data analysis** – Chi-square and correlation tests were used. Data was analysed using Epi Info software.

RESULTS: A total of 120 babies were included in this study. Their cord blood bilirubin, Hb and TSH were measured. These values were compared with the bilirubin value at 72 hours of life and Hb at sixth month. Our study showed that out of 120 babies, a total of 82 babies (68.3%) had a cord blood bilirubin value of > 2 mg/dL, which was taken as the cut off. Out of the 82, 49 babies (59.7%) developed significant hyperbilirubinemia at 72 hours of life and 33(40.2%) had a bilirubin value of <14mg/dL at 72 hours of life. Out of the 120 babies, 62 babies (51.6%) developed significant hyperbilirubinemia (>14 mg/dL) at 72 hours of life. Out of the 62, 49(79%) had cord blood bilirubin >2 mg/dL and 13(20.9%) had cord bilirubin <2 mg/dl. A strong association was found between cord blood bilirubin (>2mg/dL) and bilirubin at 72 hrs. of life (>14mg/dL) with a p value of 0.009.(<0.05).

cord blood bilirubin	Bilirubin at 72 hours		Total	correlation	p value	chi squire	p value
	<14	>14					
<2	25	13	38	0.238	0.009	6.78	0.009
>2	33	49	82				
Total	58	62	120				

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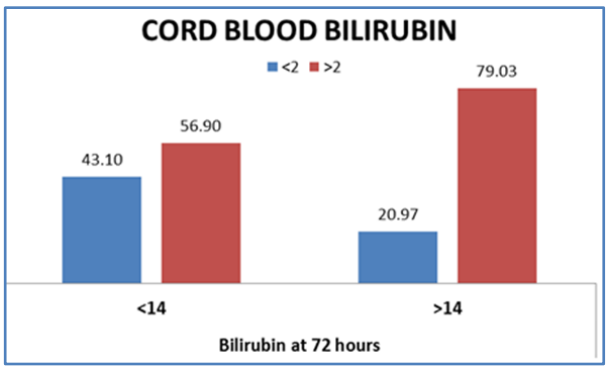
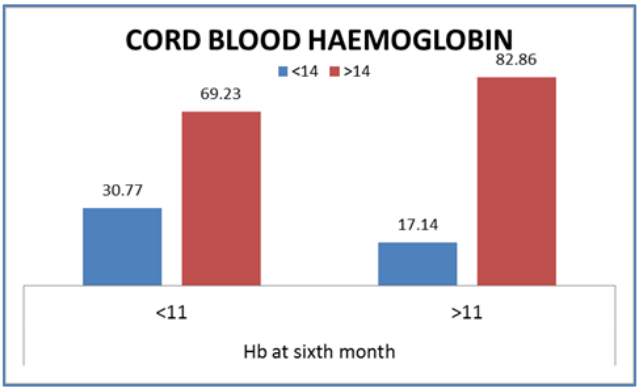


The sensitivity was 79.03% and the specificity 43.1%. Positive predictive value was found to be 59.76% and the negative predictive value was 65.79%.

Thus cord blood bilirubin value >2 mg/dL is a strong predictor of significant hyperbilirubinemia (>14mg/dL) at 72 hours of life.

cord blood Hb	Hb at sixth month		Total	correlation	p value	chi squire	p value
	<11	>11					
<14	8	6	14	0.16	.217c	1.566a	0.211
>14	18	29	47				
Total	26	35	61				



There was no association found between cord blood Hb and Hb at sixth month, as the p value was 0.211.

Bilirubin at 72 hours	ABO Compatibility		Total	p value
	C	I		
<14	37	21	58	0.218
>14	46	16	62	
Total	83	37	120	

C- Compatible, I- Incompatible

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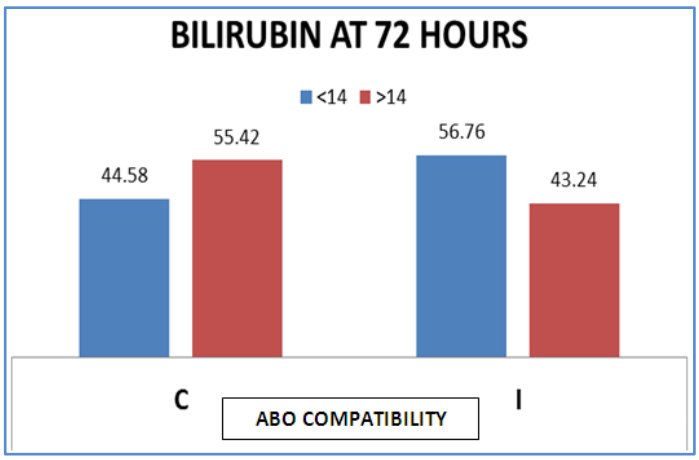

Out of the 37 cases (30.8%) with ABO incompatibility, 55.42% developed significant hyperbilirubinemia. Out of the remaining 83 cases (69.1%) with no ABO incompatibility, 43.24% developed significant hyperbilirubinemia. There were no cases of Rh incompatibility.

We have considered a TSH value of 17µIU/mL or more at birth, as the criterion for follow up after 48 hours. Out of the 120 babies, there was only one baby with cord blood TSH of 17µIU/mL and on follow up, the baby's TSH value dropped to 5µIU/mL.

DISCUSSION: Hyperbilirubinemia is one of the common causes of admission in newborns. There is concern about an increasing incidence of hyperbilirubinemia and possibility of kernicterus even in healthy term newborns.[4] The prediction of healthy neonates at risk for developing significant hyperbilirubinemia might allow simple bilirubin reducing methods to be implemented before bilirubin level reaches critical levels. We have assessed the importance of cord blood bilirubin level in predicting at risk cases for developing significant hyperbilirubinemia. There are conflicting reports about the usefulness of measuring bilirubin level in cord blood for predicting hyperbilirubinemia in newborns, but most of them agree with the value of >2mg/dL for predicting the occurrence of significant hyperbilirubinemia.[5-7]

In our study, we have got a strong association between cord blood bilirubin>2mg/dL and significant hyperbilirubinemia (>14mg/dL) at 72 hours of life with a statistical significance, p value being 0.009(<0.05).We got a sensitivity of 79.03% and specificity of 43.1%. 59.76% of babies with cord blood bilirubin >2mg/dL developed significant hyperbilirubinemia (>14mg/dL) at 72 hours of life. Whereas, 65.79% of babies with cord blood bilirubin<2mg/dL did not develop hyperbilirubinemia.

In a similar study conducted by Shaker K. Gatea from Babylon University, sensitivity was 71.4% with a specificity of 94.4%. The positive predictive value was 45.4% and negative predictive value being 98.1%.[8]

Our study showed no association between cord blood Hb and Hb at sixth month, p value being 0.211.

In the present study, 43.24% of ABO incompatible cases and 55.42% of cases without ABO incompatibility developed significant hyperbilirubinemia. In the study conducted by Shaker K. Gatea, 16.9% of ABO incompatible cases developed significant hyperbilirubinemia.

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CONCLUSIONS:

1. A cord blood bilirubin value above 2 mg /dL is a useful predictor of significant hyperbilirubinemia in healthy term newborns.
2. There was no association between cord blood Hb and Hb at sixth month, as there are multiple factors influencing Hb status in the first half of infancy.

LIMITATIONS: Study sample was too small for the conclusion to be extrapolated into the general population.

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