Original Research Article

Neonatal hyperbilirubinemia prediction by cord blood and 24-hour serum bilirubin analysis

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Abstract

Background: Hyperbilirubinemia is a clinical condition which is very often present in the pediatric practice and it constitutes one of the major issues within the neonatal period. It occurs due to physiological and pathological processes in new born babies. Neonatal hyperbilirubinemia is defined as a total serum bilirubin level above 5 mg/dL. Although 60 p.c of the term newborn babies have a clinical jaundice during the first week of life, only few have a significant underlying disease. **Aim and Objectives:** To estimate the predictive value of cord blood bilirubin, 24th hour serum and day-5 bilirubin levels in identifying neonates at-risk of developing significant hyperbilirubinemia and to study the clinical risk factors for significant hyperbilirubinemia also to determine the correlation between the cord bilirubin, 24th hour and day-5 total serum bilirubin. **Material and Methods:** A hospital based, analytical cross-sectional study was conducted in Department of Pediatrics at Narayana Medical College and Hospital, Chintareddy Palem, Nellore, Andhra Pradesh for a period of 6 months from 1st April 2018 to 30 September 2018. Prior to the study initiation, ethical clearance was obtained and written consent was taken from the parents of the respective newborns. The study subjects included all the term newborn babies born. A predesigned, pre-tested, semi-structured proforma was used to collected the data. The data was collected, entered in Microsoft excel-2013 and analyzed using SPSS version-22 (trial). Data was presented in percentages, proportions and figures **Results:** the mean cord blood total serum bilirubin (TSB) among 152 neonates was 2.07 + 0.28, the mean TSB at 24th hour and on day-5 among 21 jaundiced neonates were 7.51 + 1.66 and 17.03+ 1.56 respectively. **Conclusion:** Cord blood bilirubin and 24-hr total serum bilirubin levels of neonates predict hyperbilirubinemia condition in early and treatment can be started appropriately.

Key Words: Hyperbilirubinemia, Jaundice, Neonate.

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INTRODUCTION

Hyperbilirubinemia is a clinical condition which is very often present in the pediatric practice and it constitutes one of the major issues within the neonatal period. It occurs due to physiological and pathological processes in new born babies.[1] Neonatal hyperbilirubinemia is defined as a total serum bilirubin level above 5 mg/dL.[2] Although 60 p.c of the term newborn babies have a clinical jaundice during the first week of life, only few have a significant underlying disease.[3] Hyperbilirubinemia is a cause of concern both for the parents and the paediatrician. It occurs among 5-10 p.c of the healthy term infants and is the commonest reason for readmission after an early hospital diacharge.[4] There exists a correlation between bilirubin levels in the umbilical cord blood and hyperbilirubinemia among newborn's with ABO in compatibility, newborn babies presenting with bilirubin levels higher than 4mg/dl are at risk of developing severe hyperbilirubinemia and should be followed up and reassessed.[5] Neonatal factors that predispose to neonatal jaundice are birth weight, gestational age, gender, siblings with a history of jaundice, genetic and ethnic factors,

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excess weight loss, early feeding, birth trauma and infant of diabetic mother. Maternal factors that predispose to neonatal jaundice are mode of delivery, increased maternal age, drugs (Oxytocin, bupivacaine, antenatal dexamethasone), smoking and heroin addiction in the mother and delayed cord clamping.[6, 7, 8] The etiology of neonatal jaundice in less than 24 hours of birth include Rh isoimmunization, ABO and minor blood group incompatibility, Intrauterine infections (TORCH, Malaria, Bacterial) and Glucose-6-Phosphate Dehydrogenase deficiency (G6PD deficiency).[9]

AIM and OBJECTIVES

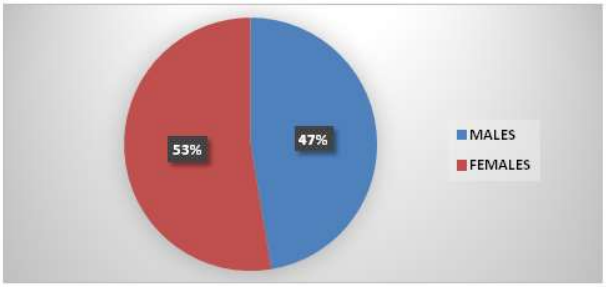
1. To estimate the predictive value of cord blood bilirubin, 24th hour serum and day-5 bilirubin levels in identifying newborn babies at risk of developing significant hyperbilirubinemia.
2. To study the clinical risk factors for significant hyperbilirubinemia.
3. To determine the correlation between the cord bilirubin, 24th hour and day-5 total serum bilirubin.

MATERIAL AND METHODS

A hospital based, analytical cross-sectional study was conducted in Department of Pediatrics at Narayana Medical College and Hospital, Chintareddy Palem, Nellore, Andhra Pradesh for a period of 6 months from 1st April 2018 to 30 September 2018. Prior to the study initiation, ethical clearance was obtained from the Institutional Ethics Committee and written consent was taken from the parents of the respective newborns. The study subjects included all the term newborn babies born in Narayana Medical College and Hospital, Nellore. Extremely low birth weight babies, neonates with major congenital malformations, preterm newborn babies and very sick neonates were excluded from the study. Cord blood was collected soon after the delivery before clamping the cord for bilirubin, blood bilirubin levels analysed by spectrophotometry by spectral method. Blood grouping, Rh typing and Hb% were done. A blood sampling was done at 24hrs ± 6hrs of postnatal age for the estimation of total serum bilirubin levels by spectral method using a spectrophotometer. This method is based on the fact that bilirubin absorbs light approximately at 454 nm and hemoglobin absorbs light equally at 454 nm and 540 nm as well. The effect of hemolysis was eliminated by subtracting the 540 nm absorbance from 454 nm and thus only bilirubin absorbance can be measured. This assay may be suitable for less than 2 to 3 week neonates. Complete blood picture, peripheral blood smear, Direct Coombs Test (DCT), septic screen, reticulocyte count, hematocrit, thyroid function tests, G6PD levels, serum bilirubin total and direct were done whenever necessary. Those babies with jaundice on day 1 and within 5 days of postnatal age were examined and managed appropriately. Rest of the babies was followed till day 5 for the evidence of neonatal jaundice. Day 5 serum bilirubin was estimated for those icteric babies, who had yellowish discoloration extending below the knees. Babies with icterus upto the palms and soles and with total serum bilirubin levels > 15mg/dl were kept under phototherapy and exchange transfusion was done as per the unit guidelines. Babies with significant jaundice on day 5 were investigated further. A predesigned, pre-tested, semi-structured proforma was used to collected the data. The data was collected, entered in Microsoft excel-2013 and analyzed using SPSS version-22 (trial). Data was presented in percentages, proportions and figures etc. Appropriate statistical tests were used where necessary.

RESULTS

In the present study a total number of 152 cases of term newborn babies were studied during the period from 1st April 2018 to 30 September 2018. The mean birth weight of babies was 2.68 ± 0.24 kg and range were 1.82 kg to 4.12 kg. Among the one fifty two study subjects, 80 (52.6 p.c) were females and 72 (47.3 p.c) were males (Figure-1). In figure-2 the distribution of neonates based on the presence of hyperbilirubinemia shows that majority were non-jaundiced 86.2 p.c (131) followed by jaundiced 13.8 p.c (21) respectively. In table-1, bilirubin levels were compared, the mean cord blood total serum bilirubin (TSB) among 152 neonates was 2.07 + 0.28, the mean total serum bilirubin (TSB) at 24th hour among 21 jaundiced neonates was 7.51 + 1.66 and the mean total serum bilirubin (TSB) on day-5 among 21 jaundiced neonates was 17.03+ 1.56 respectively. In table-2, correlation between the cord bilirubin, 24th hour and day-5 total serum bilirubin was analyzed and found to be that there exists a statistically significant correlation between all the groups. In table-3, distribution of neonates based on various clinical risk factors of hyperbilirubinemia were identified and discussed.



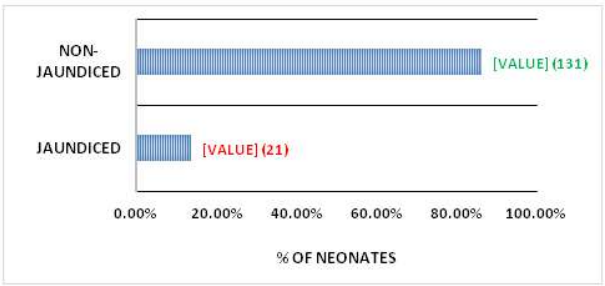


FIGURE 1: DISTRIBUTION OF NEONATES BASED ON GENDER; **FIGURE 2:** DISTRIBUTION OF NEONATES BASED ON HYPERBILIRUBINEMIA

TABLE-1: COMPARISON OF MEAN BILIRUBIN LEVELS AT VARIOUS INTERVALS

PARAMETER	NUMBER OF NEONATES	MEAN	S.D
Cord Blood TSB	152	2.07	0.28
TSB (mg/dl)24th hr	21	7.51	1.66
TSB (mg/dl) Day-5	21	17.03	1.56

TABLE 2: CORRELATION BETWEEN THE CORD BILIRUBIN, 24TH HOUR and DAY-5 TOTAL SERUM BILIRUBIN

PARAMETER	CORRELATION COEFFICIENT (r)	NUMBER OF NEONATES	p-value
Cord bilirubin with TSB5	0.655	21	**0.004**
Cord bilirubin with 24th hr TSB	0.905	131	**0.0001**
24th hour TSB with TSB5	0.486	21	**0.003**

TABLE-3: DISTRIBUTION OF NEONATES BASED ON CLINICAL RISK FACTORS OF HYPERBILIRUBINEMIA

PARAMETER		JAUNDICE	NON JAUNDICE	p-value
GENDER	MALE	12.5% (n=9)	87.55 (n=63)	**0.009**
	FEMALE	16.25% (n=13)	83.75% (n=67)	
MODE OF DELIVERY	SVD	15.8% (n=12)	84.2% (n=64)	**0.02**
	ELECTIVE LSCS	6.5% (n=3)	93.5% (n=43)	
	EMERGENCY LSCS	28% (n=7)	72% (n=18)	
	OUTLET FORCEPS	20% (n=1)	80% (n=4)	
MEAN BIRTH WEIGHT		2.21 ± 0.21 kg	2.62 ± 0.24 kg	NA
GRAVIDA	PRIMI	11.5% (n=7)	88.5% (n=54)	**0.002**
	MULTI	16.5% (n=15)	83.5% (n=76)	
Antenatal Complications	PIH	13.6% (n=3)	86.4% (n=19)	NA
	PROM > 12hrs	18.7% (n=3)	81.3% (n=13)	
	DM	66.7% (n=2)	33.3% (n=1)	
	Rh Negative	44.4% (n=4)	55.6% (n=5)	
	Anaemia	08% (n=2)	92% (n=23)	
	H/O Peripartum fever	15.4% (n=2)	84.6% (n=11)	
	Others (APH, Chronic Systemic disease, Oligo/polyhydramnios)	16.7% (n=2)	83.3% (n=10)	
	None	21.4% (n=9)	78.6% (n=33)	
Jaundice in the sibling		9.86% (n=15)	90.14% (n=137)	**< 0.05**
Vit K Administration		13.8% (n=21)	86.2% (n=131)	**< 0.05**
Cephalohematoma		3.95% (n=6)	96.05% (n=146)	**< 0.05**

***Spontaneous Vaginal Delivery (SVD); Pregnancy Induced Hypertension (PIH); Diabetes Mellitus (DM)**

DISCUSSION

Early discharge of the healthy term newborns from the hospital after delivery has recently become a common practice for medical, social and economic reasons. This study was designed to determine the predictive value of cord bilirubin and 24th hour serum bilirubin, clinical risk factors to identify the neonates at risk of significant hyperbilirubinemia. Neonates whose post-delivery hospital stay is less than or equal to 72 hours are at a significantly greater risk for readmission than those whose stay is greater than 72 hours.[11] In the present study also the results were similar to Soskolane EL *et al*[11] study.

TABLE 4: COMPARISION OF INCIDENCE OF JAUNDICE

S.NO	STUDY	INCIDENCE OF JAUNDICE AMONG NEONATES
1	PRESENT	13.8%
2	Maisels *et al*[1]	14%
3	Narang *et al*[4]	6.56%
4	Singhal *et al*[10]	5.9%

CONCLUSION

Cord bilirubin greater than 2.3 mg/dL and 24th hour serum bilirubin levels greater than or equal to 6mg/dL were found to be good predictive values in identifying neonates who were likely to develop significant hyperbilirubinemia later.

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