Original Research Article

Study of PCV levels in neonatal jaundice

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Abstract

In the present study, Neonates with Jaundice between 36 hrs and 10 days of age in term babies were studied packed cell volume in percentage. Newborns appear jaundiced when the serum-bilirubin is greater than 7mg/dl. 25-50% term newborns and a higher percentage of pre-term newborns develop clinical jaundice. This transient hyper-bilirubinemia has been called physiological jaundice. This study was conducted at Department of Paediatrics, Mahatma Gandhi Memorial Hospital and Department of Physiology, Kakatiya Medical College, Warangal. Neonatal jaundice can be entirely benign physiologic process. It can be the first sign of serious illness with associated toxicity manifested into the nervous system.
Key Words: Serum Bilirubin, Packed Cell Volume, Physiological Jaundice, Vandenberg Reaction, Bilirubin-albumin Complex.

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INTRODUCTION

Physiological Jaundice may be harmful in a pre-term baby (Hence, it is a misnomer in a pre-term baby). Physiological Jaundice is caused by an increased bilirubin load presented to the liver cells as a result of rapid breakdown of fetal RBC's combined with transient limitation in the conjugation and excretion of bilirubin by the liver. Jaundice is visible on the 2nd or 3rd day but never before 36 hrs. of age. It increases initially for one or two days in term babies and for 3 to 6 days in pre-term babies. It then starts declining and is not visible beyond 10 days in a term neonate and beyond 14 days in pre-term neonates and if present is pathological. There are no characteristic clinical features of physiological jaundice and its diagnosis is based on its time of onset, maximum limits of intensity and age of disappearance. However the most important criteria for the diagnosis of physiological jaundice is to exclude the possibility of pathological jaundice by careful history, physical examination and investigation.

MATERIALS AND METHODS

This present study was conducted at Department of Paediatrics, M.G.M. Hospital / Kakatiya Medical College, Warangal during the period from January 2017 to June 2017. A detailed case-sheet proforma was prepared and data collected from 60 neonates admitted for neonatal jaundice. All the neonates with jaundice were subjected for biochemical analysis like Serum-bilirubin – Total, indirect and direct, packed cell volume blood grouping and Rh typing both babies and mothers carried out.

Methods:

1. Serum Bilirubin Total, direct and indirect.
   Estimation was done by Malloy and Evelyn Method by Vandenberg reaction.

Total Bilirubin	=	Direct Esterified Soluble in Water And Methanol	+	Indirect Non-esterified Soluble in Methanol

$$Mg\% = \frac{\text{Optical density of test} \times \text{Concentration of working Standard}}{\text{OD Standard} \quad \text{Volume of Serum taken}} \times 100$$

Estimation of Haematocrit / PCV: Principle:
A sample of blood to which an anticoagulant has been added is centrifuged in a haematocrit tube. The RBCs (Sp.gravity = 1.090) being heavier than plasma (Sp. Gravity = 1.030) get packed towards the bottom of the tube by the centrifugal force. The reading of the percentage of blood that is red cell is than noted.

RESULTS

Table 1: Depicts of neonatal age at admission with number and percentage and PCV percentage

Sr No.	Age at Admission in days	No. of Neonates	Percentage of Neonates	Sr. Bilirubin in mg%			PCV %
				Total	Indirect	Direct	
1.	0-1	01	0	0	0	0	0
2.	1-2	0.8	13-56	11.2	10.3	0.8	42
3.	2-3	10	20.36	10.51	9.52	1	42
4.	3-4	05	15.67	18.71	17.71	1	42
5.	4-5	07	11.56	15.8	14.8	1	40
6.	5-6	12	17.52	12.32	13.23	1	42
7.	6-7	03	15.2	15.2	14.2	1	42
8.	7-8	01	10.52	20.7	19.7	1	42
9.	8-9	11	13.67	18.27	17.72	1	43
10.	9-10	04	6.82	18.1	16.72	1.4	44

Table 2: Depicts hematological indices in neonatal jaundice in relation to baby's blood group

Sr No	Baby's Blood Group	No. of Neonates	Percentage of Neonates	(Average) Sr. Bilirubin in mg%			PCV %
				Total	Indirect	Direct	
1.	O Rh +Ve	21	41.18	17.05	16.08	0.97	42
2.	O Rh –Ve	0	0	0	0	0	0
3.	A Rh +Ve	12	23.52	17.95	16.9	1.05	41
4.	A Rh –Ve	0	0	0	0	0	0
5.	B Rh +Ve	18	35.29	16.84	15.9	0.94	44
6.	B Rh –Ve	0	0	0	0	0	0
7.	AB Rh +Ve	0	0	0	0	0	0
8.	AB Rh –Ve	0	0	0	0	0	0

Table 3: Depicts hematological indices in neonatal jaundice in relation to maternal blood group

Sr. No.	Maternal Blood Group	No. of Neonates	Percentage of Neonates	(Average) Sr. Bilirubin in mg%			PCV %
				Total	Indirect	Direct	
1.	O Rh +Ve	21	41.18	17.37	16.37	1	41
2.	O Rh –Ve	03	5.88	15.15	14.17	0.98	42
3.	A Rh +Ve	06	11.77	15.40	14.40	1	44
4.	A Rh –Ve	0	0	0	0	0	0
5.	B Rh +Ve	21	41.18	17.66	16.86	0.80	42
6.	B Rh –Ve	0	0	0	0	0	0
7.	AB Rh +Ve	0	0	0	0	0	0
8.	AB Rh –Ve	0	0	0	0	0	0

Statistical Analysis: The study population of 60 neonates with jaundice were analysed in terms of physiological bilirubinemia (< 1.5mg% TSB) and Pathological bilirubinemia (> 1.5mg% TSB) for presence of significant risk factors for neonatal hyper-bilirubinemia. A 2x2 (Four Cell) contingency table prepared for all variables separately and sensitivity, specificity and odd's ratios calculated. All variables tested for significance by using unpaired students 't' test for probability of the highest 't' value of chance at particular degrees of freedom variables considered significant if they had a 'p' value of < 0.05. For all variables standard error, SE of difference calculated.

Table 4: Depicts distribution of variables among neonatal jaundice as physiological and pathological bilirubinemia with statistical indices

Sr. No.	Varibales	Neonatal Jaundice						Sensitivity	Specificity	Odds Ratio	Standard Error of Difference	'p' value
		Physiological 12 TSB 15 or < 15mg%			Pathological 39 TSB > 15mg %							
		No. of babies	%	Average TSB	TSB No.	%	Average TSB					
1	Sex-Male	09/12	75	13.47	24/39	61.54	17.18	75%	38.46%	1.875	1.679	<0.001
2.	Low Birth Weight	06/12	50	14.40	12/39	30.77	17.33	50%	69.23%	2.25	2.814	<0.01
3.	Gestational Maturity (pre-term)	03/12	25	13.80	09/39	23.08	16.90	25%	76.93%	1.111	5.620	<0.01
4.	Delayed Feedings/ Hypoclycemia	03/12	25	15.00	15/39	38.46	17.83	25%	61.54%	0	2.726	<0.02
5.	Birth Asphyxia	0/12	0	-	15/39	38.46	18.32	0%	61.54%	0	2.726	<0.02
6.	Cephalo Hematoma (Birth Injury)	0/12	0	-	03/39	7.69	22.80	0%	92.3%	0	10.799	<0.1
7.	Respiratory Distress Syndrome (RDS)	03/12	25	13.80	0/39	0	-	25%	100%	117	6.50	<0.1
8.	Hypothermia	0/12	0	-	03/39	7.69	16.20	0%	92.3%	0	7.638	<0.1
9.	Maternal 'O" Blood Group	03/12	25	11.60	21/39	53.85	17.88	25%	46.16%	0.286	4.99	<0.001
10.	Baby's 'A' Blood Group	03/12	25	15.00	09/39	23.08	18.94	25%	76.93%	1.111	6.29	<0.001
11.	Baby's 'B' Blood Group	06/12	50	13.80	12/39	30.77	22.65	50%	69.23%	2.25	1.99	<0.1

DISCUSSION

In the present study 60 neonates were studied for hyper-bilirubinemia in the physiological age range > 36 hrs to 10 days in term babies and 14 days in pre-term babies for neonatal jaundice. More than 2/3 of neonates were admitted for neonatal jaundice between 2 to 6 days of age but with higher bilirubin levels wth fairly physiological levels of packed cell volume (42%). Dehydration is a risk factor for neonatal hyper-bilirubinemia most of the LBW babies in Indian Community are IUGR (Intra-Uterine Growth Retardation). IUGR babies have higher packed Cell volume and prone for hyper-bilirubinemia. Approximately ¼ cases were pre-mature babies and showed higher PCV of 44%. This could be due to haemo concentration secondary to higher insencible water loss (through transepidermal and respiratory routes). Both pre-maturity and hemo-concentration were risk factors for neonatal hyper-bilirubinemia[2,3,4]. Other neonatal co-morbid conditions associated with neonatal jaundice in the descending order of frequency are hypoglycemia (45%) birth asphyxia (37.5%), birth injury, i.e. cephal heamatoma, RDS (7.5%) and hypothermia (2.5%). It is a common custom in Indian Community to withhold breast feeds for the first few days (2-3 days) of life. This may be responsible for hypoglycemia and dehydration especially in low birth weight and pre-term babies and high risk babies[5,6]. Hypoglycemia, causes neonatal jaundice. Hypoxia and acidosis are contributing factors for hyper-bilirubinemia in birth asphyxia neonatas. Hypoglycemia and hypothermia may also contribute to some extent[7,8]. Babies belonging to A and B Blood Group born to mother with 'O' blood group are prone for ABO incompatibility. Two such cases were encountered in the study population with negative Coomb's test and fairly normal levels of PCV (42.2%).

CONCLUSION

Jaundice appearing between 24-72 hrs. of birth reaches a peak on fourth day and disappears by 8 to 10 days. The serum bilirubin does not exceed 15mg%. Fifteen neonates with jaundice were associated with birth asphyxia (37.5%) with serum bilirubin levels – total 18.1mg% indirect 17.1 mg% and direct 1 mg% and packed cell volume 42%. Prematurity and low birth weight babies are prone for hyper-bilirubinemia with maternal risk factors. PCV <40% was found to be a significant risk factor for neonatal hyper-bilirubinemia with 'p' value <0.05.

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