ORIGINAL ARTICLE

Common Indications of Exchange Transfusion in Neonates with Jaundice Presenting to a Tertiary Care Health Facility

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ABSTRACT

Objective: To determine the frequency of common indications of exchange transfusion in neonates with jaundice presenting to a tertiary care health facility.

Study Design: A descriptive cross-sectional study.

Place and Duration: Department of Paediatrics, National Institute of Child Health, Karachi Pakistan, from January 2022 to June 2022.

Methodology: All neonates up to 28 days of either gender presenting with jaundice were included. Details about gender, ethnicity, blood group, feeding practices and indications of exchange transfusion were noted.

Results: The mean age of the patients was 10.71±9.68 days. There were 66 (50.4%) males and 65 (49.6%) females. The Mean weight and gestational age were found to be 3.39±0.37 kg and 39.34±1.07 weeks respectively. Feeding practice among majority (n=78, 59.5%) of the mother was mixed (n=78, 59.5%). ABO incompatibility was observed in 31 (23.7%), Rh incompatibility in 24 (18.3%) and unidentified cause in 11 (8.4%) neonates.

Practical Implications: For hyperbilirubinemia in neonates, ABO incompatibility was found to be the most frequent causative factor behind exchange transfusion.

Conclusion: ABO incompatibility was found to be the most common indications of exchange transfusion followed by Rh incompatibility in neonates with jaundice presenting to tertiary care facility.

Keywords: ABO incompatibility, exchange transfusion, jaundice, Rh incompatibility, neonates.

INTRODUCTION

Newborns below 35 weeks of gestational age are more vulnerable to developing bilirubin related disorders.[1] It is harder to calculate the extent of the risk of bilirubin related disorders as insufficient data is available. There was always a need to establish guidelines to treat jaundiced newborns of gestational age <35 weeks, later on, it was also suggested by the neonatologist members of the Section on Perinatal Pediatrics of The American Academy of Pediatrics (AAP), therefore, in 2007, a group of specialists was compelled by the AAP committee on Fetus and Newborn to fulfill the need.[2,3]

Literature shows that ABO incompatibility (25%), Rh incompatibility 10 (41.7%) and unidentified causes (33.3%) are the most frequently noted conditions for exchange transfusion in the jaundiced newborns.[4] Another study revealed that ABO compatibility (30.0%), Rh compatibility (13.3%), septicemia (6.6%) and unidentified causes (50%) were the commonest indications for exchange transfusion.[5] It was described in a study that the most frequently observed causative factor of neonatal hyperbilirubinemia where exchange transfusion was indicated and performed were ABO incompatibility spotted in 25% jaundiced newborns followed by Rh incompatibility in 21.3%.[6] Recent data has shown that hyperbilirubinemia needing exchange transfusion in the neonatal period is a challenging medical condition while ABO incompatibility is described to be the commonest indication behind exchange transfusion by some researches.[8]

The inadequate availability of the statistics in Pakistan and variation in international studies regarding this issue were the motives to conduct this study. So, keeping in mind, to produce local data and to explain the significance of indications, this study was designed which was thought to provide statistical data of indications of exchange transfusion in neonates presenting with jaundice. Objective of this study was to determine the frequency of common indications of exchange transfusion in neonates with jaundice presenting to tertiary care facility.

METHODOLOGY

Study Design, Place and Duration: This descriptive cross-sectional study was conducted at The Department of Paediatrics, National Institute of Child Health (NICH), Karachi Pakistan from January 2022 to June 2022.

Sample Size: The minimum sample size of 113 neonates was calculated considering frequency of ABO incompatibility as 25% with confidence level 95% and margin of error as 8%.[4]

Sample Selection: For this study, we enrolled 131 neonates adopting non-probability consecutive sampling technique. Inclusion criteria were neonates of either gender up to 28 days of age, suffering from jaundice. Exclusion criteria were non-consenting parents/guardians and neonates with congenital anomalies.

Data Collection: ─Approval from "Institutional Ethical Review Board" was acquired. Informed and written consents were obtained from parents/guardians. Jaundice was labeled as presence of gross yellow discoloration of skin, sclera and mucous membrane and confirmed on serum total bilirubin more than 331.5 µmol/l (19.5 mg/dL). ABO incompatibility was termed as presence of all of the following; neonate with jaundice, neonate blood group A or B and mother blood group O.Rh incompatibility was labeled as mother Rh-negative blood and neonate Rh-positive blood. Neonatal jaundice without any identified causes other than ABO incompatibility or Rh incompatibility were labeled as unidentified cause. Exchange transfusions were done following institutional protocols. A customized format was designed to record study data.

Data Analysis: The collected data was analyzed through "Statistical Package for Social Sciences (SPSS)" version 26:00. Frequencies and percentages were presented for gender, ethnicity, blood group of neonates, feeding practices and indications of exchange transfusion. Mean and standard deviation (SD) were calculated for age, age at onset of jaundice, weight and gestational age. Effect modifiers like age, age at onset of jaundice, gender, blood group of mother and baby, weight, gestational age, ethnicity and feeding practices were dealt through stratification. Chi square test was applied after stratification and p value < 0.05 as statistically significant.

RESULTS

In a total of 131 neonates, 66 (50.4%) were male. The mean age of the patients was 10.71±9.68 days while 90 (68.7%) neonates were aged ≤ 10 days. The mean age at the onset of the disease was found to be 5.89 ±4.47 days. Majority (n=88, 67.2%) of the

neonates had ≤5 days of age at the onset of the jaundice. The mean weight of the neonate was 3.39 ±0.37kg. The mean gestational age of the neonate was 39.34±1.07 weeks. Ethnicity of majority (n=42, 32.1%) of the neonates was Sindhi, followed by Balochi (n=39, 29.8%), Pashtoon (n=28, 21.4%) and Punjabi (n=22, 16.8%). Feeding practice among majority (n=78, 59.5%) of the mother was mixed (n=78, 59.5%). Table-1 and 2 are showing baseline characteristics of the neonates.

Table-1: Characteristics of Neonates (n=131)

Characteristics		Number (%)
Gender	Male	66 (50.4%)
	Female	65 (49.6%)
Age (days)	≤10	90 (68.7%)
	>10	41 (31.3%)
Age at the onset of jaundice	≤5	88 (67.2%)
	>5	43 (32.8%)
Body Weight (kg)	≤3	39 (29.8%)
	>3	92 (70.2%)
Gestational age (weeks)	≤39	83 (63.4%)
	>39	48 (36.6%)
Ethnicity	Sindhi	42 (32.1%)
	Punjabi	22 (16.8%)
	Balochi	39 (29.8%)
	Pashtoon	28 (21.4%)
Blood grouping of neonates	O	12 (9.2%)
	B	76 (58.0%)
	A	32 (24.4%)
	AB	11 (8.4%)
Blood grouping of mothers	O	53 (40.5%)
	B	48 (36.6%)
	A	24 (18.3%)
	AB	6 (4.6%)
Feeding Practice	Exclusive breastfeeding	53 (40.5%)
	Bottle feeding or mixed feeding	78 (59.5%)

Table-2: Description of Quantitative Data (n=131)

Quantitative Variables	Mean ±SD	Minimum	Maximum
Age of the neonates (in days)	10.71 ±9.68	2	29
Age at the onset of jaundice (in days)	5.89 ±4.47	1	13
Weight (kg)	3.39 ±0.37	2.80	3.90
Gestational age (weeks)	39.34 ±1.07	38	41

Table-3: Comparison of ABO incompatibility with baseline characteristics (n=131)

Study Variables	ABO Incompatibility		p-value
	Yes (n=31)	No (n=100)	
Age, years			
≤10	25 (27.8)	65 (72.2)	0.101
>10	6 (14.6)	35 (85.4)	
Gender			
Male	18 (27.3)	48 (72.7)	0.327
Female	13 (20)	52 (80)	
Age at the onset of jaundice			
≤5	21 (23.9)	67 (76.1)	0.939
>5	10 (23.3)	33 (76.7)	
Weight, kg			
≤3	12 (30.8)	27 (69.2)	0.213
>3	19 (20.7)	73 (79.3)	
Gestational age, weeks			
≤39	25 (30.1)	58 (69.9)	0.022
>39	6 (12.5)	42 (87.5)	
Ethnicity			
Punjabi	1 (4.5)	21 (95.5)	0.14
Sindhi	12 (28.6)	30 (71.4)	
Balochi	11 (28.2)	28 (71.8)	
Punjabi	7 (25)	21 (75)	
Blood Group of neonates			
O	0 (0)	12 (100)	0.248
B	20 (26.3)	56 (73.7)	
A	8 (25)	24 (75)	
AB	3 (27.3)	8 (72.7)	
Blood Group of mothers			
O	31 (58.5)	22 (41.5)	<0.001
B	0 (0)	48 (100)	
A	0 (0)	24 (100)	
AB	0 (0)	6 (100)	
Family Practice			
Top Feeding	15 (28.3)	38 (71.7)	0.303
Mixed	16 (20.5)	62 (79.5)	

Exchange transfusion was performed in 66 (50.3%) neonates. ABO incompatibility was the most common indication observed in 31 (23.7%), Rh incompatibility in 24 (18.3%), and unidentified cause in 11 (8.4%) neonates. Comparison was done to see the effect of Common indications of exchange transfusion with respect to baseline characteristics. Results are shown in table 3 to 5.

Table-4: Comparison of Rh incompatibility with baseline characteristics (n=131)

Study Variables	Rh Incompatibility		
	Yes (n=24)	No (n=107)	p-value
Age, years			
≤10	20 (22.2)	70 (77.8)	0.087
>10	4 (9.8)	37 (90.2)	
Gender			
Male	14 (21.2)	52 (78.8)	0.389
Female	10 (15.4)	55 (84.6)	
Age at the onset of jaundice			
≤5	16 (18.2)	72 (81.8)	0.953
>5	8 (18.6)	35 (81.4)	
Weight, kg			
≤3	9 (23.1)	30 (76.9)	0.360
>3	15 (16.3)	77 (83.7)	
Gestational age, weeks			
≤39	20 (24.1)	63 (75.9)	0.025
>39	4 (8.3)	44 (91.7)	
Ethnicity			
Punjabi	1 (4.5)	21 (95.5)	0.130
Sindhi	8 (19)	34 (81)	
Balochi	11 (28.2)	28 (71.8)	
Punjabi	4 (14.3)	24 (85.7)	
Blood Group of neonates			
O	0 (0)	12 (100)	0.302
B	14 (18.4)	62 (81.6)	
A	8 (25)	24 (75)	
AB	2 (18.2)	9 (81.8)	
Blood Group of mothers			
O	24 (45.3)	29 (54.7)	<0.001
B	0 (0)	48 (100)	
A	0 (0)	24 (100)	
AB	0 (0)	6 (100)	
Family Practice			
Top Feeding	14 (26.4)	39 (73.6)	0.048
Mixed	10 (12.8)	68 (87.2)	

Table-5: Comparison of unidentified cause with baseline characteristics (n=131)

Study Variables	Unidentified Cause		p-value
	Yes	No	
Age, years			
≤10	9 (10)	81 (90)	0.327
>10	2 (4.9)	39 (95.1)	
Gender			
Male	5 (7.6)	61 (92.4)	0.733
Female	6 (9.2)	59 (90.8)	
Age at the onset of jaundice			
≤5	8 (9.1)	80 (90.9)	0.682
>5	3 (7)	40 (93)	
Weight, kg			
≤3	4 (10.3)	35 (89.7)	0.617
>3	7 (7.6)	85 (92.4)	
Gestational age, weeks			
≤39	9 (10.8)	74 (89.2)	0.184
>39	2 (4.2)	46 (95.8)	
Ethnicity			
Punjabi	1 (4.5)	21 (95.5)	0.513
Sindhi	4 (9.5)	38 (90.5)	
Balochi	2 (5.1)	37 (94.9)	
Punjabi	4 (14.3)	24 (85.7)	
Blood Group of neonates			
O	0 (0)	12 (100)	0.608
B	6 (7.9)	70 (92.1)	
A	4 (12.5)	28 (87.5)	
AB	1 (9.1)	10 (90.9)	
Blood Group of mothers			
O	11 (20.8)	42 (79.2)	<0.001
B	0 (0)	48 (100)	
A	0 (0)	24 (100)	
AB	0 (0)	6 (100)	
Family Practice			
Top Feeding	5 (9.4)	48 (90.6)	0.724
Mixed	6 (7.7)	72 (92.3)	

DISCUSSION

Hyperbilirubinemia in newborns is observed frequently in the clinical practice, particularly during the initial weeks of life.[7-9] It has been noted that between 8-11% of the newborns suffer from hyperbilirubinemia. If the total elevation of the serum bilirubin (TSB) in the initial weeks crosses the 95th percentile for age (which is hazardous area), hyperbilirubinemia is established.[10,11] Among the healthy neonates, the presentation of idiopathic jaundice is likely to be between 60-80%.[12] There have been a several kinds of bilirubinemia associated disorders presented in newborns like physiological jaundice, pathological jaundice, jaundice caused by breast feeding or breast milk and hemolytic jaundice which includes three subtypes caused by Rh factor incompatibility, ABO blood group incompatibility and jaundice caused by the deficiency of Glucose-6-phosphate dehydrogenase (G6PD).[13]

The greater number of the mothers considered for the study were practicing mixed feeding practice.[14] There is a lot of variation in the standing of Rh disease if there exists Rh-negative maternal status, but in most of the countries having low or middle income countries (LIMCs), the main concern is to give importance to the inexpensive protections. In majority of the LMICs there are limitations to perform regular blood tests for the healthcare of mothers and neonates, by which the management of ABO incompatibility is also influenced, as it is a factor leading towards severe neonatal jaundice.[15-21]

We observed in our study that ABO incompatibility was the most common indication for exchange transfusion while Rh incompatibility was the 2nd most common indication for exchange transfusion and in 8.4% newborns, no identifiable cause was noted. In newborns with jaundice, the frequently occurring indications of exchange transfusion, reported by a study were ABO incompatibility (25%), Rh incompatibility (41.67%) and in (33.33%) cause was unknown.[4] Another study noted indications of exchange transfusion to be ABO incompatibility in 30.0% neonates, Rh incompatibility 13.3%, septicaemia 6.6% while in 50% cases, no identifiable cause was found.[5] For hyperbilirubinemia in newborns, ABO incompatibility (25%) was found to be the most frequent causative factor for which exchange transfusion was executed whereas Rh incompatibility (21.3%) was after that.[6]

Among pregnant females, the occurrence of ABO compatibility for the blood groups of mother and fetus is between 15-20%.[22] The mothers having infants with blood group O need to be monitored carefully and kept for at least 72 hours and then be discharged. The newborns are not suggested to go for the screening of the cord blood if their mothers have the blood group O.[23] Generally, it takes 24 hours after the birth of the newborn to develop jaundice due to ABO compatibility. It is necessary to collect data and take certain measures for pathological jaundice if the incidence of jaundice is prominent or it develops in the initial 24 hours.[24] For serum bilirubin between 12-17 mg/dl, it is recommended to go for comprehensive phototherapy according to the postnatal age of the newborn.[25]

CONCLUSION

ABO incompatibility was found to be the most common indications of exchange transfusion followed by Rh incompatibility in neonates with jaundice presenting to tertiary care facility.

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