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Original Research Article

Factors Affecting the Duration of Hospital Stay in Newborn with Hyperbilirubinemia Admitted in a Tertiary Care Pediatric Hospital of Kolkata

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Conflict of interest: Nil

Abstract:

Introduction: Despite being a temporary condition, neonatal jaundice is still the most common cause of hospitalization in the first week of life. Physiological jaundice is due to the developmental insufficiency of bilirubin uptake, transport, and conjugation in the new-born liver.

Aims: To identify and analyse the factors influencing the duration of hospital stay in neonates diagnosed with hyperbilirubinemia.

Materials & Methods: The present study was Prospective study. This Study was conducted from January 2017 - June 2018 for one year at Tertiary Care Paediatric Hospital of Kolkata. Total 150 Hyperbilirubinemia patients were included in this study.

Result: Among the neonates studied, 53.3% had ABO incompatibility, while 46.7% did not. Rh incompatibility was observed in 14.7% of cases, with the majority (85.3%) showing no Rh incompatibility. These findings suggest ABO incompatibility was more common than Rh incompatibility among hospitalized neonates with hyperbilirubinemia. Among neonates with a long hospital stay, 36.5% had ABO incompatibility, while 63.5% did not. In contrast, 75.4% of those with shorter stays had ABO incompatibility. This suggests that the absence of ABO incompatibility was more frequently associated with prolonged hospitalization.

Conclusion: The duration of hospital stay in neonates with hyperbilirubinemia is influenced by multiple factors. ABO incompatibility and G6PD deficiency are significant contributors to prolonged hospitalization, while Rh incompatibility appears less prevalent.

Keywords: Neonatal hyperbilirubinemia, ABO incompatibility, Rh incompatibility and G6PD deficiency.

Introduction

Despite being a temporary condition, neonatal jaundice is still the most common cause of hospitalization in the first week of life. Physiological jaundice is due to the developmental insufficiency of bilirubin uptake, transport, and conjugation in the newborn liver.

Decreased gut motility, delayed passage of bilirubin rich meconium, and absence of intestinal bacteria that degrades bilirubin to urobilinogen may all contribute to hyperbilirubinemia by increasing enterohepatic circulation [1]. Delayed initiation of breastfeeding and technical problems in nursing may cause maternal milk insufficiency and increase the risk of hyperbilirubinemia [2]. In recent years, increased cesarean section (c/s) rates and promotion of breastfeeding and earlier hospital discharge caused an increased frequency of neonatal hyperbilirubinemia. Jaundice is more prominent and lasts longer in breastfed infants. Type of the anesthesia used for c/s may also affect the risk for hyperbilirubinemia [3].

Understanding the major contributing factors of early neonatal hyperbilirubinemia may help clinicians to identify the infants at highest risk of hy-

perbilirubinemia since earlier discharge is a new cost reducing strategy in most clinics. Furthermore, identifying infants with risk of hyperbilirubinemia and observing closely before discharge might reduce both morbidity and readmission rates.

Neonatal hyperbilirubinemia is a common condition affecting a significant proportion of newborns, characterized by elevated serum bilirubin levels leading to jaundice. While most cases are benign and resolve with minimal intervention, some require hospitalization for phototherapy or more intensive treatment. The duration of hospital stay can vary based on several factors, including gestational age, birth weight, underlying causes, and response to treatment. Prolonged hospitalization not only increases healthcare costs but also impacts parental bonding and resource utilization.[4]

This study aims to identify and analyze the factors that influence the length of hospital stay in neonates with hyperbilirubinemia.

To identify and analyze the factors influencing the duration of hospital stay in neonates diagnosed with hyperbilirubinemia.

Material and Methods

Study Design: Prospective study.

Study Place: Tertiary Care Paediatric Hospital of Kolkata,

Study Time: January 2017 - June 2018

Sample size: 150 Hyperbilirubinemia patients

Study parameter:

- ABO incompatibility
- Rh incompatibility
- Sepsis
- Hypothyroidism
- G6PD deficiency
- Cephalohematoma
- Maturity
- Severe hyperbilirubinemia
- Birth Asphyxia
- Conjugated hyperbilirubinemia

Inclusion Criteria:

- Neonates (≤28 days old) diagnosed with hyperbilirubinemia.
- Admitted to the hospital for treatment of jaundice.
- Complete medical records available for analysis.

Exclusion Criteria:

- Neonates with major congenital anomalies.
- Neonates with birth asphyxia or severe perinatal complications.
- Transferred in or out during treatment (incomplete hospital stay).
- Neonates with incomplete or missing clinical data.

Statistical Analysis: Data were entered into Excel and analysed using SPSS and Graph Pad Prism. Numerical variables were summarized using means and standard deviations, while categorical variables were described with counts and percentages. Two-sample t-tests were used to compare independent groups, while paired t-tests accounted for correlations in paired data.

Chi-square tests (including Fisher's exact test for small sample sizes) were used for categorical data comparisons. P-values ≤ 0.05 were considered statistically significant.

Result

Table 1: Distribution according to blood group incompatibility

	Blood group incompatibility	Frequency	Percentage
ABO incompatibility	Yes	80	53.3
	No	70	46.7
Rh incompatibility	Yes	22	14.7
	No	128	85.3

Table 2: Association between ABO Incompatibilities, Rh incompatibility, Sepsis, Hypothyroidism, G6PD deficiency: Long hospital stays

		Long hospital stay		Total
ABO incompatibility		**Yes**	**No**	
	Present	31(36.5%)	49(75.4%)	80(53.3%)
	Absent	54(63.5%)	16(24.6%)	70(46%)
	Total	85(100%)	65(100%)	150(100%)
Rh incompatibility	**Present**	18(21.2%)	4(6.2%)	22(14.7%)
	Absent	67(78.8%)	61(93.8%)	128(85.3%)
	Total	85(100%)	65(100%)	150(100%)
Sepsis	**Present**	17(20%)	4(6.2%)	21(14%)
	Absent	68(80%)	61(93.8%)	129(86%)
	Total	85(100%)	65(100%)	150(100%)

Hypothyroidism	**Present**	8(9.4%)	1(1.5%)	9(6%)
	Absent	77(90.6%)	64(98.5%)	141(94%)
	Total	85(100%)	65(100%)	150(100%)
G6PD deficiency	**Present**	10(11.8%)	0(0%)	10(6.7%)
	Absent	75(88.2%)	65(100%)	140(93.3%)
	Total	85(100%)	65(100%)	150(100%)

Table 3: Association between Cephalohematoma, Maturity, Severe hyperbilirubinemia, Birth Asphyxia, Conjugated hyperbilirubinemia: Long hospital stay

		Long hospital stay		**Total**
Cephalohematoma		**Yes**	**No**	
	Present	4(4.7%)	3(4.6%)	7(4.7%)
	Absent	81(95.3%)	62(95.4%)	143(95.3%)
	Total	85(100%)	65(100%)	150(100%)
Maturity	**Preterm**	55(64.7%)	32(49.2%)	87(58%)
	Term	30(35.3%)	33(50.8%)	63(42%)
	Total	85(100%)	65(100%)	150(100%)
Severe hyperbilirubinemia	**>20mg/dl**	49(57.6%)	21(32.3%)	70(46.7%)
	≤20mg/dl	36(42.4%)	44(67.7%)	80(53.3%)
	Total	85(100%)	65(100%)	150(100%)
Birth Asphyxia	**Present**	7(8.2%)	7(10.8%)	14(9.3%)
	Absent	78(91.8%)	58(89.2%)	136(90.7%)
	Total	85(100%)	65(100%)	150(100%)
Conjugated hyperbilirubinemia	**Present**	8(9.4%)	0(0%)	8(5.3%)
	Absent	77(90.6%)	65(100%)	142(94.7%)
	Total	85(100%)	65(100%)	150(100%)

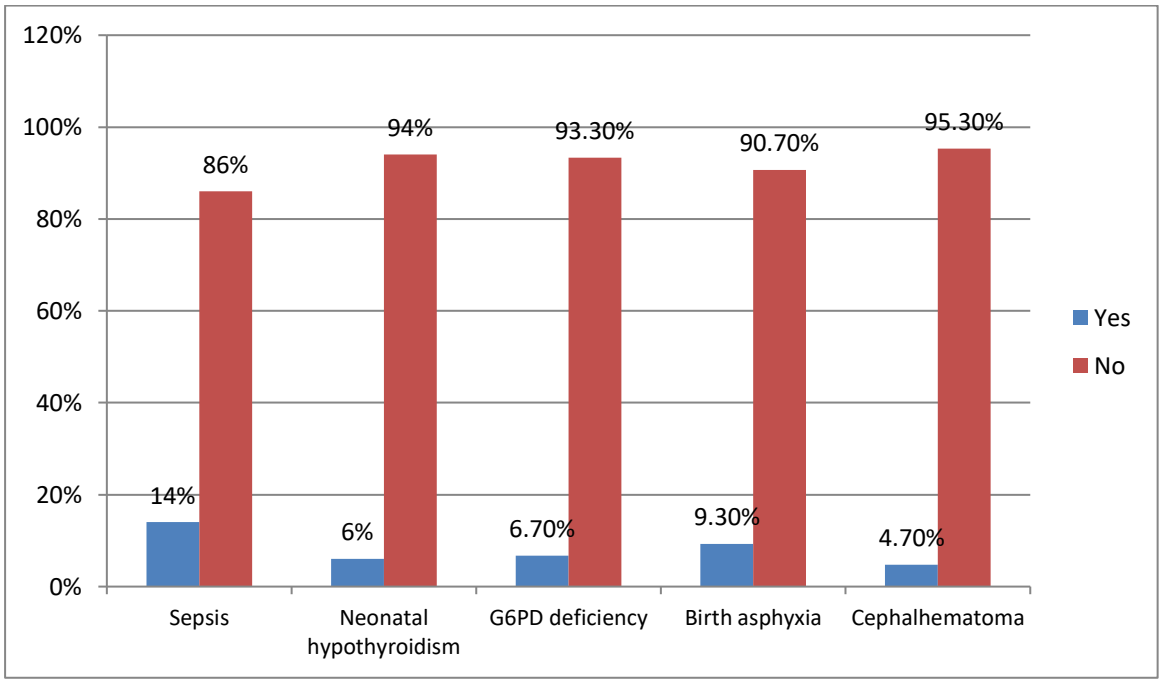

Figure 1 : Distribution of neonates according to neonatal history

Among the neonates studied, 53.3% had ABO incompatibility, while 46.7% did not. Rh incompatibility was observed in 14.7% of cases, with the majority (85.3%) showing no Rh incompatibility. These findings suggest ABO incompatibility was more common than Rh incompatibility among hospitalized neonates with hyperbilirubinemia. Among neonates with a long hospital stay, 36.5% had ABO incompatibility, while 63.5% did not. In contrast, 75.4% of those with shorter stays had ABO incompatibility. This suggests that the absence of ABO incompatibility was more frequently associated with prolonged hospitalization. Among neonates with a long hospital stay, 21.2% had Rh incompatibility, compared to only 6.2% among those with shorter stays. The majority of neonates without Rh

incompatibility had shorter hospital stays (93.8%). This indicates a possible association between Rh incompatibility and prolonged hospitalization.

Sepsis was present in 20% of neonates with a long hospital stay, compared to only 6.2% in those with shorter stays. Most neonates without sepsis (93.8%) had shorter hospital stays. This suggests that the presence of sepsis may contribute to prolonged hospitalization in neonates with hyperbilirubinemia.

Hypothyroidism was observed in 9.4% of neonates with a long hospital stay, compared to just 1.5% among those with shorter stays. The majority of neonates without hypothyroidism (98.5%) had shorter hospital stays. These findings suggest a potential link between hypothyroidism and prolonged hospitalization in neonates with hyperbilirubinemia.

G6PD deficiency was present in 11.8% of neonates with a long hospital stay and absent in all those with shorter stays (100%). None of the neonates with a short stay had G6PD deficiency. This indicates a possible association between G6PD deficiency and increased duration of hospitalization in neonates with hyperbilirubinemia.

Cephalohematoma was present in 4.7% of neonates with a long hospital stay and in 4.6% of those with a short stay. The vast majority in both groups did not have cephalohematoma. This suggests that cephalohematoma had no significant impact on the duration of hospital stay in neonates with hyperbilirubinemia.

Among neonates with a long hospital stay, 64.7% were preterm, compared to 49.2% in the short stay group. Term neonates made up 35.3% of the long stay group and 50.8% of the short stay group. These findings suggest that preterm birth is associated with a longer duration of hospitalization in neonates with hyperbilirubinemia.

Severe hyperbilirubinemia (>20 mg/dL) was present in 57.6% of neonates with a long hospital stay, compared to 32.3% in those with shorter stays. In contrast, 67.7% of the short-stay group had bilirubin levels ≤20 mg/dL. This indicates that higher bilirubin levels are associated with prolonged hospitalization in neonates.

Birth asphyxia was present in 8.2% of neonates with a long hospital stay and in 10.8% of those with a short stay. The majority in both groups did not experience birth asphyxia. These results suggest that birth asphyxia had no significant impact on the duration of hospital stay in neonates with hyperbilirubinemia. Conjugated hyperbilirubinemia was present in 9.4% of neonates with a long hospital stay and absent in all neonates with shorter stays. All neonates in the short-stay group had unconjugated hyperbilirubinemia. This suggests that conjugated hyperbilirubinemia may be associated with prolonged hospitalization in neonates.

During study period sepsis was found in 21 (14%), neonatal hypothyroidism in 9 (6%), G6PD deficiency in 10 (6.7%), birth asphyxia in 14 (9.3%) and cephalohematoma in 7 (4.7%) of neonates.

Discussion

In this study, 53.3% of neonates had ABO incompatibility compared to 14.7% with Rh incompatibility, indicating ABO incompatibility was over three times more common. The majority, 85.3%, showed no Rh incompatibility, highlighting its lower prevalence. These percentages emphasize ABO incompatibility as the predominant blood group factor associated with neonatal hyperbilirubinemia in the hospital setting. A similar study, conducted at the Jimma Medical Center in Ethiopia, 54% of neonates with hyperbilirubinemia had ABO incompatibility, while 12% had Rh incompatibility. The adjusted odds ratio (AOR) for developing hyperbilirubinemia in ABO-incompatible neonates was 3.94 (95% CI: 1.69–9.21), indicating a significantly higher risk compared to those without ABO incompatibility. Additionally, the study found that sepsis was associated with 2.9 times higher odds of neonatal hyperbilirubinemia (AOR: 2.94; 95% CI: 1.16–7.45).[5]

Among neonates with long hospital stays, 36.5% had ABO incompatibility compared to 75.4% in the short-stay group, indicating a lower prevalence of ABO incompatibility in prolonged stays. Conversely, 63.5% of long-stay neonates lacked ABO incompatibility, suggesting its absence may be linked to longer hospitalization. These percentages imply that factors other than ABO incompatibility might contribute more to extended hospital stays. In a study conducted at the Jimma Medical Center in Ethiopia, 54% of neonates with hyperbilirubinemia had ABO incompatibility, while 12% had Rh incompatibility. The adjusted odds ratio (AOR) for developing hyperbilirubinemia in ABO-incompatible neonates was 3.94 (95% CI: 1.69–9.21), indicating a significantly higher risk compared to those without ABO incompatibility.[5]

Among neonates with long hospital stays, 21.2% had Rh incompatibility versus 6.2% in the short-stay group, showing a higher prevalence in prolonged stays. Additionally, 93.8% of neonates without Rh incompatibility experienced shorter hospitalizations. These percentages suggest Rh incompatibility may be a significant factor contributing to extended hospital stays. Sepsis was observed in 20% of neonates with long hospital stays, compared to 6.2% in those with shorter stays, indicating a higher prevalence in prolonged hospitalization. Furthermore, 93.8% of neonates without sepsis had shorter stays. These percentages highlight

sepsis as a likely contributor to extended hospital duration in neonates with hyperbilirubinemia.

Hypothyroidism was present in 9.4% of neonates with long hospital stays versus 1.5% in those with shorter stays, indicating a higher occurrence in prolonged stays. Additionally, 98.5% of neonates without hypothyroidism had shorter hospitalizations. These percentages suggest hypothyroidism may be associated with increased duration of hospital stay in neonates with hyperbilirubinemia.

G6PD deficiency was found in 11.8% of neonates with long hospital stays, while 0% of those with shorter stays had the deficiency. All neonates in the short-stay group were free of G6PD deficiency. These percentages suggest a strong association between G6PD deficiency and prolonged hospitalization in neonates with hyperbilirubinemia. In a study conducted by Kaplan et al., G6PD deficiency was identified as a significant risk factor for prolonged neonatal jaundice and extended hospital stay. The study found that neonates with G6PD deficiency were more likely to experience severe hyperbilirubinemia requiring longer phototherapy and hospitalization.[6]

Cephalohematoma was present in 4.7% of neonates with long hospital stays and 4.6% with shorter stays, showing almost equal prevalence. The majority, over 95%, in both groups did not have cephalohematoma. These percentages indicate that cephalohematoma likely does not influence the duration of hospital stay in neonates with hyperbilirubinemia. In a retrospective study evaluating factors influencing hospital stay in neonates with hyperbilirubinemia, cephalohematoma was found in a small percentage of patients (around 5%) with no significant difference in hospital stay duration between those with or without cephalohematoma.[7]

Among neonates with long hospital stays, 64.7% were preterm compared to 49.2% in the short-stay group, indicating a higher prevalence of prematurity in prolonged stays. Term neonates accounted for 35.3% of long stays and 50.8% of short stays. These percentages suggest that preterm birth is associated with increased duration of hospitalization in neonates with hyperbilirubinemia. A study by Bhutani et al. examined the impact of prematurity on the clinical course of neonatal hyperbilirubinemia. The results indicated that preterm infants had a significantly higher risk of prolonged hospitalization due to delayed bilirubin clearance and increased susceptibility to complications such as bilirubin-induced neurologic dysfunction.[8] Severe hyperbilirubinemia (>20 mg/dL) was observed in 57.6% of neonates with long hospital stays, compared to 32.3% in the short-stay group. Conversely, 67.7% of neonates with shorter stays had bilirubin levels ≤20 mg/dL. These percentages indicate that higher bilirubin levels are linked to prolonged hospitalization in neonates. A study by Olusanya et al. reported that neonates with severe hyperbilirubinemia (total serum bilirubin >20 mg/dL) had significantly longer hospital stays compared to those with lower bilirubin levels. The severity of hyperbilirubinemia was associated with an increased need for intensive treatments such as phototherapy and exchange transfusions, which contributed to prolonged hospitalization.[9]

Birth asphyxia was present in 8.2% of neonates with long hospital stays and 10.8% of those with shorter stays, showing similar low prevalence in both groups. The majority—over 89%—in both groups did not experience birth asphyxia. These percentages suggest that birth asphyxia does not significantly affect the duration of hospital stay in neonates with hyperbilirubinemia. A study by Kumar et al. evaluated the influence of birth asphyxia on neonatal outcomes including hyperbilirubinemia and hospital stay duration. They found that the prevalence of birth asphyxia was low among neonates with hyperbilirubinemia and did not significantly correlate with prolonged hospitalization.[10]

Conjugated hyperbilirubinemia was observed in 9.4% of neonates with long hospital stays and was absent (0%) in those with shorter stays. Conversely, 100% of neonates with short stays had unconjugated hyperbilirubinemia. These percentages suggest that conjugated hyperbilirubinemia is linked to prolonged hospitalization in neonates. A study by Feldman et al. investigated the clinical course of conjugated hyperbilirubinemia in neonates and found that infants with conjugated hyperbilirubinemia experienced significantly longer hospital stays compared to those with unconjugated hyperbilirubinemia. The prolonged hospitalization was attributed to the underlying liver dysfunction and the need for more extensive diagnostic workups and treatments.[11]

During the study period, sepsis was diagnosed in 14% of neonates, neonatal hypothyroidism in 6%, and G6PD deficiency in 6.7%. Birth asphyxia and cephalohematoma were observed in 9.3% and 4.7% of neonates, respectively. These findings highlight the varying prevalence of comorbid conditions that may influence the clinical course of neonates with hyperbilirubinemia. A study by Olusanya et al. reported that among neonates with hyperbilirubinemia, sepsis was diagnosed in approximately 12%, G6PD deficiency in 7%, and birth asphyxia in 10% of cases. Additionally, congenital hypothyroidism and cephalohematoma were noted as contributing factors in a smaller percentage of neonates. The presence of these comorbidities was associated with variations in the clinical course and hospital stay duration.[12]

Conclusion

The duration of hospital stay in neonates with hyperbilirubinemia is influenced by multiple factors.

ABO incompatibility and G6PD deficiency are significant contributors to prolonged hospitalization, while Rh incompatibility appears less prevalent. Sepsis notably increases hospital stay length, underscoring the impact of infection on clinical outcomes.

Prematurity and severe hyperbilirubinemia (>20 mg/dL) are also associated with extended admissions due to increased vulnerability and treatment needs. Conversely, conditions like cephalohematoma and birth asphyxia show minimal influence on stay duration. Recognizing these factors is crucial for optimizing management strategies and reducing hospital stay in affected neonates.

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