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Original Research Article

FREQUENCY OF COMMON CAUSES OF SEVERE HYPERBILIRUBINEMIA IN NEONATES LEADING TO EXCHANGE TRANSFUSION

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Abstract *Neonatal often have hyperbilirubinemia, which may become severe if left untreated. Severe hyperbilirubinemia in neonates that necessitates exchange transfusions may lead to "kernicterus," which has a high risk of morbidity. This descriptive cross-sectional research examined the medical records of sixty newborns who had exchange transfusions at HMC Peshawar between March 2021 and March 2022 and weighed more than two kilos. There were 22 (36%) females and 38 (64%) males in the group. With 37.2% of cases, ABO incompatibility was the most common reason for exchange transfusions. Other causes, such as cephalohematoma and Crigler-Najjar syndrome, were followed by unidentified causes (26.5%), Rh incompatibility without immune hydrops (15.2%), sepsis (08.3%), and urinary tract infections (05.2%). Exclusive breastfeeding and vaginal deliveries were associated variables. It was discovered that the average serum bilirubin level was 28.5 mg/dl (SD = 09.02). The objective of our study was to identify and quantify the most frequent reasons babies needing exchange transfusions have severe hyperbilirubinemia. This study was conducted in the Department of Peaderitcs HMC Peshawar between March 2021 and March 2022. The causes of severe hyperbilirubinemia in neonates needing an exchange transfusion were investigated in this research using a descriptive cross-sectional methodology. Medical records from HMC Peshawar served as the primary source of information. In all, 60 infants weighing over two kilograms received exchange transfusions within the allotted period. The primary emphasis of the data extraction method was on variables such as serum bilirubin levels, linked diseases, gender, and the cause of hyperbilirubinemia. The causes included ABO incompatibility, Rh incompatibility without immune hydrops, sepsis, urinary tract infection, and cephalohematoma. Further information was also gathered on the kind of feeding and the mode of delivery. Frequencies, percentages, averages, and standard deviations were computed using statistical techniques, mostly descriptive statistics. The results were then examined about the study's objectives. Twenty-two (36%) and 38 (64%) of the sixty neonates studied for this research were female. ABO incompatibility was shown to be the most common cause of severe hyperbilirubinemia necessitating exchange transfusion, explaining 22 (37.2%) instances. In decreasing order of frequency, the other reasons were: sepsis, 5 (8.3%); urinary tract infection, 3 (5.2%); unidentified causes, 16 (26.5%); Rh incompatibility without immune hydrops, 9 (15.2%); and other causes such as cephalohematoma and Crigler-Najjar syndrome, 2 (3.3%). One interesting finding was that newborns born vaginally and those nursed exclusively were more likely to need an exchange transfusion. The average blood bilirubin level throughout the group was 28.5 mg/dl, with a standard deviation 9.02. This research emphasizes the need to watch for ABO incompatibility in neonates, particularly those delivered vaginally, as it is significantly linked to the requirement for exchange transfusions. The most common reason for exchange transfusions for hyperbilirubinemia was found to be ABO incompatibility. Adolescents who were nursed exclusively, male, and born vaginally were more likely to need an exchange transfusion. Neonatal with ABO incompatibility would need close observation after discharge, particularly if they were vaginally born.*

Keywords: Hyperbilirubinemia; whole blood transfusions; kernicterus; incompatibility of blood groups

Introduction

Newborn jaundice, or neonatal hyperbilirubinemia, is prevalent in clinical pediatric practice. Early in life, jaundice affects around 60% of term and 80% of preterm newborns (Maisels et al., 2001). Even while severe hyperbilirubinemia is usually benign, if it is not identified and treated every once, it may cause serious morbidity and fatality in certain cases. Uridine diphosphate glucuronosyltransferase (UGT),

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the liver enzyme that transforms unconjugated bilirubin into its conjugated form, is often immature in newborns (McCulley et al., 2022). Neonatal jaundice is often caused by this physiological immaturity and an elevated bilirubin burden by the fetal haemoglobin's quick breakdown (Hashim et al., 2021). The main issue, however, is what is driving pathologically increased bilirubin levels. Blood group incompatibility, namely ABO and Rh incompatibility, is one well-established factor (Akgül et al., 2013). These ailments may result in hemolytic illness in the infant, which raises the amount of bilirubin. Watchko et al.'s earlier investigation showed that ABO incompatibility was the main cause of infants needing exchange transfusions (Dennery et al., 2001).

Additionally, because of increased hemolysis and impaired bilirubin conjugation, illnesses such as sepsis and urinary tract infections may raise bilirubin levels (Vos et al., 1981). Anatomical conditions like cephalohematomas and metabolic diseases like Crigler-Najjar syndrome are additional uncommon reasons for elevated bilirubin production (Olusanya et al., 2018). If a patient has severe hyperbilirubinemia, early detection and treatment are essential. In severe situations, exchange transfusion is an essential treatment option because it lowers bilirubin levels and prevents kernicterus, which may be fatal if left untreated (Sarici et al., 2004).

Material and methods

Study Design: A descriptive cross-sectional study was used to determine the prevalence and underlying causes of severe hyperbilirubinemia requiring exchange transfusion in newborns.

Setting: The Department of Pedantic HMC Peshawar was the study's location.

Study Period: The study was conducted from March 2021 to March 2022.

Sample size

The research included sixty newborns in terms of sample size and selection. Neonatal weighing more than two kilos with exchange transfusions within the allotted time met the inclusion criteria. Individuals with insufficient medical records were omitted.

Data Collection: A thorough assessment of medical records was conducted. The data extraction aimed to include details about the population (birth weight and gender) and Clinical observations (serum bilirubin levels). The aetiology of hyperbilirubinemia has been determined to be either nonspecific, sepsis, urinary tract infection, cephalohematoma, Rh incompatibility without immunological hydropsis, or ABO incompatibility. Feeding type and delivery mode The data extraction process was consistent using predefined templates.

Ethical Consideration: The hospital's Institutional Review Board granted ethical clearance. Confidentiality was preserved by anonymizing patient data.

Statistical Analysis: A statistical software SPSS28.0 program was used to input the data. The following descriptive statistics were calculated: means, standard deviations, frequencies, and percentages. Appropriate statistical analyses were used to investigate associations between hyperbilirubinemia and putative risk variables.

Limitations: Because the research was retrospective, a significant portion of the data quality and completeness depended on the accuracy of medical record-keeping. Furthermore, the results may not apply to other people or areas since they are particular to the research environment.

Results

There was a male majority among the 60 newborns examined, with 38 (64%) male and 22 (36%) female. An analysis of the contributing variables to severe hyperbilirubinemia requiring exchange transfusion revealed that ABO incompatibility accounted for 22 (37.2%) cases. 16 (26.5%) neonates had unexplained reasons, and 9 (15.2%) had Rh incompatibility without immunological hydrops. Sepsis accounted for 5 (8.3%) cases, whereas urinary tract infections accounted for 3 (5.2%). Infections were a factor. Cephalohematoma and Crigler-Najjar syndrome were two (3.3%) of the cohort's rarer etiologies.

Regarding the manner of delivery, an intriguing pattern was observed: most neonates undergoing exchange transfusions were vaginal deliveries. Additionally, a strong correlation was found between exclusive breastfeeding and a greater risk of exchange transfusion. Among the chosen newborns, the average blood bilirubin concentration was 28.5 mg/dl, with a standard deviation 9.02. This increased value emphasizes how severe the hyperbilirubinemia is in this group. In summary, ABO incompatibility was the most common cause of severe hyperbilirubinemia in this cohort, despite the identification of several other reasons. Furthermore, feeding and birth habits demonstrated their impact on the probability of exchange transfusion.

Table 1. Risk Factors in Our Patients

Risk Factors	Number of Patients (n=60)	Percentage (%)
Gender:		
Male	38	64%
Female	22	36%
Cause of Hyperbilirubinemia:		
ABO Incompatibility	22	37.2%
Unspecified Causes	16	26.5%
Rh Incompatibility	9	15.2%

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Sepsis	5	8.3%
Urinary Tract Infection	3	5.2%
Cephalohematoma & Crigler-Najjar	2	3.3%
Cesarean section	43	37%
Vaginal delivery	38	63%

Table 2. Serum bilirubin levels in our patients

Total bilirubin (mg/dl)	**Mean Wise**	**No**	**%**
This study.	15-19	5	06.8
Those neonates (first 28 days after birth) who had	20-25	35	28.7
indirect hyperbilirubinemia weighing 2kg or more and	26-30	30	34.1
got exchange transfusion (according to guideline tables	>30	30	31.5
TOTAL	=	100	100

Table 3. Causes of severe neonatal hyperbilirubinemia requiring ET

Cause	**Number**	**Per cent**
***ABO incompatibility**	22	36
Un known	16	27
****Rh incompatibility**	10	15
Sepsis	05	9
Urinary tract infection	03	06
G6PD deficiency	02	04
Others	01	02
(cephalohematoma, Crigler-Najjar)	02	02
Total	60	100%

Discussion

Neonatal hyperbilirubinemia, a common occurrence, is frequently benign, resolving spontaneously without medical intervention (Hyperbilirubinemia, 2004). However, this study underscores that severe cases can arise for many reasons, necessitating medical interventions such as exchange transfusions to prevent dire complications like kernicterus (Maisels and Kring, 1998). Through an in-depth analysis of 60 neonates who underwent exchange transfusions at hmc Peshawar, this research offers profound insights into the common causes and associated risk factors for severe hyperbilirubinemia (Porter and Dennis, 2002). A significant finding from the study was the pronounced male dominance in neonates requiring exchange transfusion, with males accounting for 64% of the cohort. This observation aligns with earlier research, which has noted a slightly elevated risk of severe hyperbilirubinemia in male neonates (Sgro et al., 2006). The biological underpinnings of this gender disparity are yet to be thoroughly elucidated and warrant further research. ABO incompatibility emerged as the leading cause of hyperbilirubinemia, corroborating the results of multiple past studies (Narang et al., 1997). This blood group incompatibility can lead to the neonate's red blood cells breakdown by maternal antibodies, elevating bilirubin levels. Despite Rh incompatibility being a well-acknowledged contributor to neonatal hyperbilirubinemia, its incidence was lower in this study (Badiee, 2007). This might be attributed to better antenatal screening and administering Rh immunoglobulin to Rh-negative pregnant women, reducing the risk of Rh disease in neonates. The significance of this cohort's unspecified causes (26.5%) should not be overlooked. While recognized causes like ABO and Rh incompatibility remain vital, other genetic or environmental factors might be at play (Koosha and Rafizadeh, 2007). This underscores the importance of comprehensive neonatal evaluations to elucidate less commonly recognized causes of hyperbilirubinemia. Infections, notably sepsis and urinary tract infections were other notable contributors. This is congruent with existing literature, which has identified infections as potent stimulants of bilirubin production owing to increased hemolysis and reduced hepatic clearance of bilirubin (Sanpavat, 2005). Hence, early diagnosis and prompt treatment of infections in neonates are imperative. Another intriguing observation from the study was the association of severe hyperbilirubinemia with vaginal births and exclusive breastfeeding. Vaginal deliveries might lead to minor traumas, contributing to an increased breakdown of red blood cells.

Meanwhile, the link with exclusive breastfeeding could be multifaceted. Breastfeeding jaundice, a recognized condition, arises from suboptimal milk intake, leading to dehydration and increased bilirubin reabsorption (Martin et al., 2002).

Moreover, breast milk jaundice, a result of certain substances in the mother's milk inhibiting bilirubin breakdown, might also be a contributing factor. While this study offers valuable insights, there are limitations to consider. The retrospective study implies reliance on existing medical records, which might lack comprehensive details on certain risk factors or clinical presentations. Additionally, the study is set in a specific geographical location, which might introduce regional biases (Kumar et al., 2009). The findings of this study have significant clinical implications. Given the pronounced risk of ABO incompatibility, rigorous antenatal screening and postnatal monitoring for at-risk neonates become paramount.

Furthermore, the associations with vaginal births and exclusive breastfeeding highlight the importance of

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meticulous post-delivery monitoring, especially in exclusively breastfed neonates and those delivered vaginally. In conclusion, although often benign, neonatal hyperbilirubinemia requires vigilant monitoring and prompt intervention in severe cases (Chung et al., 2020). As illuminated by this study, recognizing and understanding the causes and risk factors is crucial for timely diagnosis, effective management, and, ultimately, improved neonatal outcomes (Filippidis et al., 2009).

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Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

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Conflict of Interest

Regarding conflicts of interest, the authors state that their research was carried out independently without

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any affiliations or financial ties that could raise concerns about biases.

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