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INCIDENCE OF EXCHANGE TRANSFUSION IN NEONATES WITH NEONATAL HYPERBILIRUBINEMIA

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Abstract:
Hyperbilirubinemia develops to some extent as a normal transition in physiology in almost all newborns. High levels of bilirubin can cross the blood-brain barrier in unbound unconjugated form and cause neurological symptoms.
Objectives: *To determine the frequency of exchange transfusion in neonates with hyperbilirubinemia and to describe the characteristics of neonates with hyperbilirubinemia, including those who underwent exchange transfusion.*
Place and Duration: *In the Pediatric department of Benazir Bhutto Hospital Rawalpindi for one-year duration from March 2019 to February 2020.*
Methods: *A retrospective study was conducted to investigate the frequency of exchange transfusion in newborns admitted to hospital with hyperbilirubinemia and to investigate selected characteristics of these infants, including: gender, gestational age, body weight, type of feeding and delivery, and to identify the causes of hyperbilirubinemia.*
Results: *A total of 120 newborns, 70 men and 50 women were enrolled in the study. Most of them (67%) were of legal age, weighing over 2.5 kg. The majority (77%) were administered vaginally, and the main source of feeding was mixed breastfeeding and formula milk. The mean value of serum bilirubin at admission was 14.7 mg / dL, and 22 mg / dL at the time of replacement for patients undergoing exchange transfusion. In 92 children (77%), the cause of the hyperbilirubinemia was unknown. Hemolytic anemia due to Rh-ABO incompatibility was found in 16% of children, and G6PD deficiency in 7%. Exchange transfusion was performed in 16.6% of patients.*
Conclusion: *Although neonatal jaundice is mostly a benign condition, pathological harmful hyperbilirubinemia can occur and despite the benefits of phototherapy, exchange transfusion is still performed and kernicterus is still present. It carries many risks for newborns and prevents kernicterus*
Keywords: *Neonatal jaundice, transfusion change, Kernicterus.*

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INTRODUCTION:

Neonatal jaundice (icterus neonatorum) has been observed in newborns for centuries [1]. Jaundice is a yellow discoloration of the skin and eyes caused by hyperbilirubinemia (increased levels of serum bilirubin)[1-2]. The level of serum bilirubin required to induce jaundice varies with skin tone and body region, but jaundice typically appears at 2-3 mg / dl (34-51 µmol / l) in the sclera and around 4-5 mg / dl in the face. mg / dL (68-86 µmol / L). As bilirubin levels increase, jaundice appears to progress from head to toe, appearing in the navel at about 15 mg / dL (258 µmol / L) and on the feet at around 20 mg / dL (340 µmol / L)[3-4]. Almost all newborns have some degree of hyperbilirubinemia, which is the normal phase of transition in physiology[5]. High levels of unconjugated bilirubin can cross the blood-brain barrier and cause neurological symptoms. Pathological hyperbilirubinemia in full-term infants is diagnosed if:

• Jaundice appears within the first 24 hours after the first week of life or lasts> 2 weeks
• Serum total bilirubin (TSB) increases> 5 mg / dL / day
• TSB is> 18 mg / dL
• The baby shows symptoms or signs of a serious illness

Some of the most common pathological causes are immune and non-immune hemolytic anemia, G6PD deficiency, hematoma resorption, sepsis, and hypothyroidism[5-6]. The main problem with excessive hyperbilirubinemia is its potential neurotoxicity. Bilirubin concentration in the brain and duration of bilirubin exposure are important determinants of the neurotoxicity of bilirubin[7-8]. Kernicterus is a German term for basal testicular jaundice and is sometimes found in babies dying of extreme jaundice. This complication was primarily observed in infants with severe hyperbilirubinemia, enhanced by hemolysis, as in the case of Rh-negative immunization. However, kernicterus has also been described in the absence of hemolysis[9]. Affected infants often died in the acute phase, and survivors had a neurological condition with choreoathetosis, visual paresis, sensorineural deafness, and occasional mental retardation. Jaundice can be insufficiently or ineffectively monitored, which can result in catastrophic consequences for the continued mortality and morbidity of small but very large numbers of healthy and valuable infants. Measuring free bilirubin in addition to the hourly total bilirubin value and estimating bilirubin production by CO measurements may be helpful in understanding the risks some children are exposed to, as they have a large bilirubin load partially distributed outside the circulation. The American Academy of Pediatrics recommends universal screening with TSB or percutaneous bilirubin (TcB) levels or targeted screening based on risk factors. The universal TSB / TcB screening test can accurately identify infants whose TSB levels are likely to exceed the 95th percentile age. Some studies have shown that the use of risk assessments is as accurate as universal screening tests to predict hyperbilirubinemia[10-11]. The most effective method of identifying infants at risk of hyperbilirubinemia appears to be a combination of universal screening and risk factor assessment. Intensive phototherapy is recommended for people with severe hyperbilirubinemia or at high risk of developing severe hyperbilirubinemia. Conventional phototherapy may also be considered for those at moderate risk of severe hyperbilirubinemia. Exchange transfusion (ET) has been widely recognized as an effective and reliable method of treating severe neonatal hyperbilirubinemia (SNH) and preventing bilirubin-induced infant mortality and chronic disease. In case of total serum bilirubin between 375 µmol / L and 425 µmol / L (21.9 mg / dL and 24.8 mg / dL), exchange transfusion should be considered to lower this concentration[12]. Exchange transfusion should also be performed immediately in people with clinical signs of bilirubin encephalopathy. The present study was conducted to determine the frequency of exchange transfusions in neonates with hyperbilirubinemia, to investigate selected characteristics of these children, including gender distribution, gestational age, birth weight, type of feeding and mode of delivery, and to identify the causes of hyperbilirubinemia in these children.

MATERIALS AND METHODS:

A retrospective study was conducted between March 2019 to February 2020 to examine the frequency of transfusion of neonatal hyperbilirubinemia in infants admitted to the neonatal intensive care unit at the Pediatric department of Benazir Bhutto Hospital Rawalpindi. The study developed a special form containing age, gender, gestational age, birth weight, birth shape, diet, serum bilirubin levels and blood mismatch (ABO and Rh), glucose deficiency 6 phosphate dehydrogenase (GPD6), sepsis and other causes of hyperbilirubinemia. The data was analyzed and expressed as number and percentage.

RESULTS:

The total study population consisted of 120 newborns 1-10 days old, 70 (58%) men and 50 (42%) women.

Table 1 Selected characteristic of the neonates with hyperbilirubinemia

Variables	N	%
Sex		
Male	70	58%
Female	50	42%
Gestational Age		
Term	80	67%
Pre-term	40	33%
Body Weight (Kg)		
>2.5	92	77%
<2.5	28	23%
Feeding		
Breast	70	58%
Milk formula	34	28%
Mixed	16	13%
Mode of Delivery		
Vaginal	80	77%
Cesarean section	28	23%

Table 1 presents the characteristics of neonates with hyperbilirubinemia and presents the distribution of the study population by sex, gestational age, body weight, nutrition, and delivery method. Of the 120 patients with hyperbilirubinemia, 20 underwent exchange transfusion (16.6%).

Table 2 Selected characteristics of the neonates with exchange transfusion

Variables	N	%
Sex		
Male	14	70%
Female	6	30%
Gestational Age		
Term	16	80%
Pre-term	4	20%
Body Weight (Kg)		
>2.5	16	80%
<2.5	4	20%
Feeding		
Breast	8	40%
Milk formula	2	10%
Mixed	10	50%
Mode of Delivery		
Vaginal	16	80%
Cesarean section	4	20%
Received Phototherapy		
Yes	14	70%
No	6	30%
Outcome		
Discharged	16	80%
Died	4	20%

Table 2 shows the distribution of newborns who underwent exchange transfusion by sex, gestational age, body weight, nutrition, mode of delivery, phototherapy treatment and outcome. Table 3 shows the presence of signs of kernicterus in babies who underwent exchange transfusion before the procedure.

Table 3 Signs of kernicterus

Sign	N
Lethargy	16
Poor feeding	16
Hypertonia	6
High pitch cry	4
Seizure	0
Apnea	2

Table 4 shows the causes of hyperbilirubinemia in the study population.

Table 4 Causes of hyperbilirubinemia

Cause	No. of neonates	%
Rh incompatibility	10	8%
ABO incompatibility	10	8%
G6PD deficiency	8	7%
Unidentifiable cause	92	77%
Total	120	100%

DISCUSSION:

Neonatal jaundice is an overwhelmingly mild disease that affects 60-80% of newborns worldwide, but in some it leads to potentially harmful severe hyperbilirubinemia. Despite the proven therapeutic benefits of phototherapy in preventing extreme hyperbilirubinemia, acute bilirubin or kernicterus encephalopathy, several low- and middle-income countries (LMICs) still report high rates of avoidable exchange transfusion, as well as bilirubin-induced mortality and neurodevelopmental disorders[13]. Proper management of neonatal jaundice is the most common challenge that pediatricians face every day. According to current research, it is worrying that 16.6% of children admitted with hyperbilirubinemia underwent exchange transfusion, which is associated with the risk and complications of this procedure[14]. This is similar to the finding in the Abakaliki study in southeastern Nigeria (16.9%) and according to their study the mean serum bilirubin at which exchange transfusion was performed was 28.3 mg / dL compared to the current study (22 mg / dl). In this study, males with hyperbilirubinemia outnumbered females (70, 50, respectively) and the gender ratio was 1.4: 1, which is approximately 1.25: 1 in a study conducted in Serbia. The male / female ratio was 2. 3: 1 in those who have undergone exchange transfusion. Most of them were full-term born, vaginal born, breastfed and of normal weight. The study found that many newborns undergoing exchange transfusion had one or more symptoms of kernicterus prior to replacement due to a delay in seeking medical advice (Table 3). No identifiable cause of high serum bilirubin was found in 77% of the study population as shown in Table 4. Isoimmune hemolysis due to Rh incompatibility was found in 10 patients (8%) compared to the study in Serbia (38%) and ABO discrepancy was found in the remaining 10 patients (8%), compared to (38%) in the same study in Serbia, these children had to be closely monitored after birth[15]. Hemolytic anemia due to G6PD deficiency was detected in 8 patients (7%), parents of these children should be informed and trained to avoid triggering factors that may trigger later hemolysis, including medications such as aspirin and NSAIDs and specific foods such as like beans and peas.

CONCLUSION:

Although neonatal jaundice is in most cases a mild condition, pathological harmful hyperbilirubinemia may occur and despite the benefits of light therapy, transfusion of lesions is still performed and kernicterus still occurs.

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