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# Outcomes of hyperbilirubinemia in neonates due to rhesus incompatibility admitted at Khyber Teaching Hospital, Peshawar

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**ABSTRACT:**

**Objective:** To determine the outcomes of hyperbilirubinemia in neonates due to rhesus incompatibility admitted at Khyber teaching hospital, Peshawar.

**Study type:** Cross sectional study

**Place:** Department of Pediatrics, Khyber teaching hospital, Peshawar.

**Duration:** March 2025 to August 2025.

**Methodology:** Total 115 newborns with hyperbilirubinemia who are 3–25 days old with rhesus incompatibility and total serum bilirubin (TSB) >12 mg/dL were included. Preterm infants, newborns with significant congenital defects, and those whose mothers tested positive for hepatitis A, B, or C were not included. Age, weight, gender, socioeconomic level, mother's occupation, education, and place of residence were among the demographic details recorded. Patients were assessed for the outcomes of kernicterus and full recovery. A heel stick (capillary blood draw) was used to obtain 0.1 to 0.3 mL (milliliters) of blood for laboratory testing in cases of hyperbilirubinemia. The Rh factor test was carried out by drawing three milliliters of blood from the mother's hand or arm vein in a sterile tube. For neonates, a heel stick was used to draw between 0.1 and 0.3 volumes of blood.

**Results:** In this study, the average age was 15.25 ± 6.56 days. Of the 115 patients, 60 (52.17%) were male and 55 (47.83%) were female, resulting in a male to female ratio of 1.1:1. The average weight in our sample was 4.09 ± 2.53 kg. In total, 53.91% of deliveries were by cesarean section and 46.09% were by SVD. According to our research, 88.70% of newborns with hyperbilirubinemia brought on by rhesus incompatibility recovered completely, whereas 11.30% developed kernicterus.

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**Conclusion:** According to this study, kernicterus occurred in 11.30% of infants who presented with jaundice as a result of Rh incompatibility.

**Keywords:** ABO incompatibility, total serum bilirubin, hyperbilirubinemia.

## INTRODUCTION:

An increase in bilirubin levels in the blood causes neonatal hyperbilirubinemia, often known as jaundice. The skin, sclera, and mucous membranes all have a yellowish tinge, which is a characteristic of this illness. It is a frequent reason for readmission to the hospital following delivery and the most prevalent medical issue during the first two weeks of life.[1] About 60% of full-term babies and 80% of preterm babies have clinical jaundice in the first week of life.[2] For the majority of newborns, unconjugated hyperbilirubinemia (UHB) is the main cause of clinical jaundice. However, some children with jaundice have conjugated hyperbilirubinemia (CHB), which is always an indication of an underlying medical or surgical issue.[3]

Unconjugated bilirubin can have bad effects on the central nervous system, especially in preterm babies and adults who don't have enough of certain enzymes.[4] If you don't obtain treatment for severe hyperbilirubinemia, it can lead to bilirubin-induced neurological dysfunction (BIND) and both acute and chronic bilirubin encephalopathy.[5] Rhesus (Rh) hemolytic illness, which is brought on by hemolytic disease of the infant, is the primary cause of jaundice within the first 24 hours of life.[6] The mother's body creates anti-D IgM and IgG when it becomes sensitized from fetomaternal infusions during prior pregnancies. Because Anti-D IgG can cross the placenta, its presence in the baby can result in rhesus

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illness. Rhesus (Rh) incompatibility occurs when a Rh-negative mother who has previously been sensitized carries a Rh-positive fetus.[6]

Of the 105 newborns in the study, 46% were female and 54% were male. Although intrauterine growth restriction affected about 16% of the newborns in the community, more than 80% of them weighed within the normal range for their gestational age. A total of 47% of the neonates were delivered via C-section[7], while 50% were delivered vaginally. According to a study, 90% of infants with hyperbilirubinemia caused by rhesus incompatibility recovered completely, whereas 10% developed kernicterus. [8]

A dangerous complication in neonates with hyperbilirubinemia is rhesus incompatibility, which is characterized by maternal antibodies attacking the newborn's red blood cells. The purpose of this study is to ascertain the consequences of hyperbilirubinemia in newborns admitted to Khyber Teaching Hospital in Peshawar because there is a dearth of local literature on this topic. Our healthcare professionals will benefit from the study's findings, which will provide important insights into the diagnosis, treatment, and prevention of newborn jaundice by illuminating its severity, progression, and possible complications.

**METHODOLOGY:**

This descriptive cross-sectional study was conducted at the Khyber Teaching Hospital's pediatric department in Peshawar from March to August of 2025 with ethical review committee approval. Based on the following assumptions, the sample size was determined to be (115). taking the result of neonatal hyperbilirubinemia brought on by rhesus incompatibility, or 10% kernicterus,[8] using a 95% confidence level and a 5.5% margin of error. Newborns with hyperbilirubinemia (yellowing of the skin and sclera (whites of the eyes), yellowing of mucous membranes, and poor feeding and total serum bilirubin (TSB) >12 mg/dL) who are 3–25 days old due to rhesus incompatibility were included. Preterm infants,

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newborns with significant congenital defects, and those whose mothers tested positive for hepatitis A, B, or C were not included.

Patients who met the study's selection criteria were included after being informed of its goals and advantages. The newborns' guardians and attendants were reassured that participating in this trial has no risks. A type of informed consent was then acquired. Age, weight, gender, socioeconomic level, mother's occupation, education, and place of residence were among the demographic details recorded. According to the operational definition, patients with hyperbilirubinemia brought on by rhesus incompatibility were assessed for the outcomes of kernicterus and full recovery. A heel stick (capillary blood draw) was used to obtain 0.1 to 0.3 mL (milliliters) of blood for laboratory testing in cases of hyperbilirubinemia. The Rh factor test will be carried out by drawing three milliliters of blood from the mother's hand or arm vein in a sterile tube. For neonates, a heel stick was used to draw between 0.1 and 0.3 volumes of blood. The entire procedure was supervised by a consultant with more than five years of post-fellowship experience. Each patient's information was recorded using the pre-made structured proforma.

The data was analyzed using SPSS 27. Age and weight were among the numerical values for which the mean + SD or median (IQR) was computed. The data's normality was examined using the Shapiro-Wilk test. For categorical data, such as gender, outcomes (completely recovered, kernicterus), mode of delivery, socioeconomic position, mother's occupation, education, and residence area, frequencies and percentages were computed. In order to address the effect modifiers, the results were stratified by age, weight, gender, mode of delivery, socioeconomic position, mother's occupation, mother's level of education, and residence area. Fisher's exact test or post-stratification Chi square was used, with a p-value of less than 0.05 being considered significant. Tables were used to display the results.

**RESULTS:**

In this study, the average age was 15.25 ± 6.56 days. Of the 115 patients, 60 (52.17%) were male and 55 (47.83%) were female, resulting in a male to female ratio of 1.1:1 (Figure I). The distribution of

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patients with additional confounding variables is shown in Table I. The average weight in our sample was 4.09 ± 2.53 kg. In total, 53.91% of deliveries were by cesarean section and 46.09% were by SVD. According to our research, 88.70% of newborns with hyperbilirubinemia brought on by rhesus incompatibility recovered completely, whereas 11.30% developed kernicterus (Figure II). The stratification of results by confounders is shown in Table II, which also indicates that no confounding variable had a statistically significant impact.

**Table I: Distribution of different variables (n=115)**

| | | **Frequency** | **%age** |
|---|---|---|---|
| **Age (days)** | 3-14 | 57 | 49.57 |
| | 15-25 | 58 | 50.43 |
| **Weight (kg)** | ≤5 | 70 | 60.87 |
| | >5 | 45 | 39.13 |
| **Mode of delivery** | SVD | 53 | 46.09 |
| | CS | 62 | 53.91 |
| **Socioeconomic status** | Low | 65 | 56.52 |
| | Middle | 31 | 26.96 |
| | High | 19 | 16.52 |
| **Residence** | Rural | 68 | 59.13 |
| | Urban | 47 | 40.87 |
| **Mother's education** | Uneducated | 38 | 33.04 |
| | Educated | 77 | 66.96 |
| **Mother's profession** | Housewife | 79 | 68.70 |
| | Working | 36 | 31.30 |

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**Figure-I: Distribution of patients according to gender of neonate (n=115).**

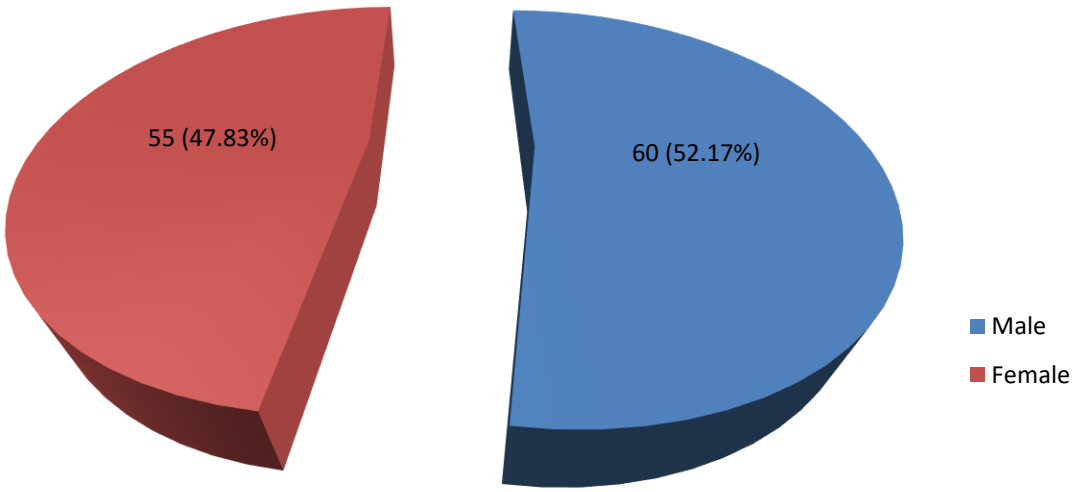

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**Figure II: Outcomes of hyperbilirubinemia in neonates due to rhesus incompatibility (n=115).**

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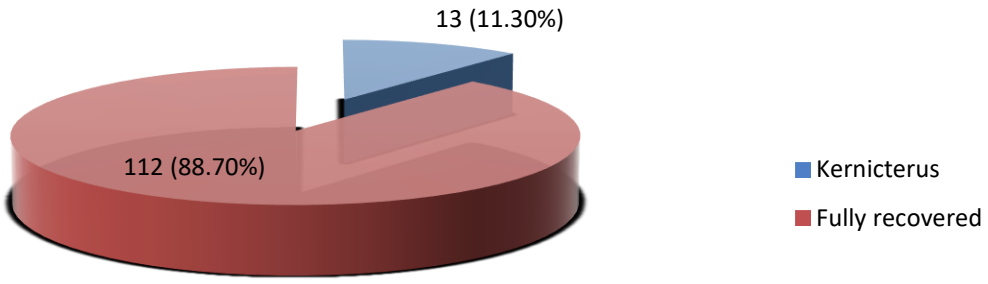


**Table II: Stratification of outcome with respect to confounders.**

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| | | Kernicterus (n=13) | Fully recovered (n=102) | P-value |
|---|---|---|---|---|
| **Age (days)** | 3-14 | 08 (14.04%) | 49 (85.96%) | **0.359** |
| | 15-25 | 05 (8.62%) | 53 (91.38%) | |
| **Gender** | Male | 07 (11.67%) | 53 (88.33%) | **0.898** |
| | Female | 06 (10.91%) | 49 (89.09%) | |
| **Weight (kg)** | ≤5 | 09 (12.86%) | 61 (87.14%) | **0.512** |
| | >5 | 04 (8.89%) | 41 (91.11%) | |
| **Mode of delivery** | SVD | 08 (15.09%) | 45 (84.91%) | **0.235** |
| | CS | 05 (8.06%) | 57 (91.94%) | |
| **Socioeconomic status** | Low | 06 (9.23%) | 59 (90.77%) | **0.691** |
| | Middle | 04 (12.90%) | 27 (87.10%) | |
| | High | 03 (15.79%) | 16 (84.21%) | |
| **Residence** | Rural | 10 (14.71%) | 58 (85.29%) | **0.166** |
| | Urban | 03 (6.38%) | 44 (93.62%) | |
| **Mother's education** | Uneducated | 05 (13.16%) | 33 (86.84%) | **0.659** |
| | Educated | 08 (10.39%) | 69 (89.61%) | |
| **Mother's profession** | Housewife | 07 (8.86%) | 72 (91.14%) | **0.220** |
| | Working | 06 (16.67%) | 30 (83.33%) | |

**DISCUSSION:**

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About 20–25% of pregnancies result in ABO incompatibility, and 10% of the afflicted offspring go on to suffer hemolytic illness. This is because most naturally occurring anti-A and anti-B antibodies are IgM subclass antibodies, which do not cross the placenta. Fetal sensitization only happens in 3-4% of cases. ABO hemolytic disease, which affects 1% of babies, is the cause of almost two-thirds of all cases of hemolytic disease in newborns.[9] The purpose of this study was to assess how neonatal jaundice affected term ABO incompatible newborns.

The male to female ratio in our study was 1.1:1, with 60 (52.17%) of the 115 patients being male and 55 (47.83%) being female. Thakur AK et al.[10] found similar results, with 48% of the newborns being female and 52% being male. The ratio of men to women was 1.08:1. Among the 240 enrolled cases, Singh R et al. found a similar result: 55% of the newborns were male and 41% were female.[11] Similarly, of the 105 term neonates in Khiangte L et al., 46% were female and 54% were male.[7] The current study discovered that jaundice in neonates was gender independent, affecting both male and female infants equally. The results matched those of a study published by Harsha et al.[12]

Out of 115 newborns with jaundice in this study, 46.09% were delivered naturally through vaginal birth (SVD) and 53.91% were delivered via lower segment caesarean section (LSCS). It was discovered that neonates delivered spontaneously had greater bilirubin levels than those delivered via cesarean section. Overall, oxytocin induction, cephalohematoma, and vacuum-assisted vaginal delivery are thought to be risk factors for hyperbilirubinemia. However, a research by Harsha et al. discovered no meaningful correlation between the technique of delivery and neonatal jaundice.[12]

It was observed in the current study that the development of pathological jaundice and the baby's birth weight were not clinically significant. In contrast, a research by Bizuneh found a direct correlation between neonatal jaundice and low birth weight.[13] In this study, 44% of the neonates received pharmaceutical therapies, 36% had phototherapy, 3% received exchange transfusions, and 7% needed no treatment at all. IVIG significantly lowers the requirement for exchange transfusions. when the range of phototherapy is increased by the total serum bilirubin level or when it is within 2–3 mg/dl of

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the exchange level.[14] According to a study by Okulu et al., a single IVIG dose is insufficient to stop exchange transfusions and does not shorten the neonatal phototherapy period.[14] In contrast, a research by El Fekey et al. found that IVIG decreased neonatal bilirubin levels, phototherapy time, and blood transfusion requirements.[15]

The current study indicates that ABO-incompatible neonates with hyperbilirubinemia necessitated phototherapy for over 50 hours, more than three times the duration required by those with ABO compatibility.[16] In our study, 88.70% of newborns with hyperbilirubinemia caused by rhesus incompatibility recovered completely, while 11.30% developed kernicterus. According to a study, 90% of infants with hyperbilirubinemia caused by rhesus incompatibility recovered completely, whereas 10% developed kernicterus.[8]

The study's conclusions have a number of significant clinical ramifications. The fact that 9.5% of newborns who present with jaundice have Rh incompatibility highlights the ongoing necessity of routine prenatal Rh screening and prompt Anti-D immunoglobulin delivery. A significant percentage of newborns still develop Rh isoimmunization despite the availability of Anti-D prophylaxis, indicating the need for enhanced maternal knowledge and prophylactic protocol adherence. Further evidence that bilirubin levels in Rh-incompatible neonates are considerably higher supports the need for early bilirubin monitoring in Rh negative mothers to prevent catastrophic issues like kernicterus.[17] Because birth weight and Rh incompatibility do not have a strong connection, all Rh-negative pregnancies should be seen as high-risk, no matter what the baby's birth weight is.[18]

There are various restrictions on this study. Because the study was only carried out at one tertiary care institution, its findings might not be as applicable in other contexts, especially in rural locations where prenatal care practices might vary. Maternal antibody titers and neonatal hemolysis indicators (such as lactate dehydrogenase and bilirubin/albumin ratio) were not evaluated in this study, which would have added to our understanding of the severity of the illness. It's possible that the small sample size reduced the ability to identify subtle correlations between newborn traits and Rh incompatibility. Conclusions

about the long-term neurodevelopmental outcomes of afflicted newborns are impossible due to the absence of follow-up data.

**CONCLUSION:**

According to this study, kernicterus occurred in 11.30% of infants who presented with jaundice as a result of Rh incompatibility. A significant percentage of mothers with Rh-incompatible neonates had received prophylaxis despite the widespread use of Anti-D immunoglobulin, indicating the need for better implementation of preventive measures. In order to prevent severe hyperbilirubinemia and associated sequelae, these findings emphasize the continued significance of Rh screening, prompt prophylaxis, and newborn bilirubin monitoring. Larger multicenter studies and longer follow-up are required for future research in order to evaluate the long-term consequences of Rh-incompatible neonates and improve preventative measures.

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