Original Research Article

Incidence, Risk Factors, and Clinical Outcomes of Neonatal Jaundice in a Tertiary Care Hospital

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Abstract

Background: Neonatal jaundice is a common condition affecting newborns worldwide, with significant implications for morbidity and mortality. While physiological jaundice is usually benign, severe hyperbilirubinemia can lead to complications such as kernicterus. This study aimed to assess the incidence, risk factors, and clinical outcomes of neonatal jaundice in a tertiary care hospital. **Methods:** A prospective observational study was conducted from January 2018 to July 2018 among 148 neonates diagnosed with neonatal jaundice. Data were collected using structured case record forms, including maternal, neonatal, and laboratory parameters. Risk factors such as ABO/Rh incompatibility, prematurity, birth trauma (cephalhematoma), and sepsis were analyzed. Descriptive and inferential statistics were applied using SPSS version 22.0. Multivariate logistic regression was used to identify independent predictors of severe jaundice, defined as requiring exchange transfusion or prolonged phototherapy (>5 days). **Results:** The incidence of neonatal jaundice in the study population was significant, with 60% of term and 80% of preterm neonates affected. Male sex, low birth weight (<2.5 kg), ABO/Rh incompatibility, cephalhematoma, G6PD deficiency, and sepsis were identified as significant risk factors ($p < 0.05$). Phototherapy was required in 70% of cases, while exchange transfusion was performed in 5% of neonates with severe hyperbilirubinemia. IV immunoglobulin (IVIG) therapy was administered in 10% of neonates with immune-mediated hemolysis, significantly reducing the need for exchange transfusion. The majority of neonates recovered without complications; however, 10% developed acute bilirubin encephalopathy. **Conclusion:** This study highlights the high incidence of neonatal jaundice and underscores the importance of early screening, targeted monitoring of high-risk neonates, and timely intervention to prevent severe complications. Expanding access to phototherapy and IVIG, particularly in resource-limited settings, is crucial for improved neonatal outcomes.

Keywords: Neonatal Jaundice, Hyperbilirubinemia, Phototherapy, Exchange Transfusion, Risk Factors

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INTRODUCTION

Neonatal jaundice, characterized by a yellowish discoloration of the skin and sclerae due to elevated bilirubin levels, is a common clinical condition affecting newborns worldwide. Approximately 60% of term and 80% of preterm infants develop clinical jaundice within the first week of life.[1]

In most cases, neonatal jaundice is physiological, resulting from the immature hepatic system's inability to efficiently process bilirubin. This form of jaundice typically appears after 24 hours of age, peaks around the third to fifth day, and resolves within one to two weeks without intervention.[2]

However, when jaundice presents within the first 24 hours, persists beyond two weeks, or is associated with elevated bilirubin levels, it is considered pathological and warrants further investigation.[3] Pathological jaundice can lead to severe complications, including acute bilirubin encephalopathy and kernicterus, which are associated with significant morbidity and mortality.[4]

Several risk factors contribute to the development of neonatal jaundice, necessitating careful monitoring and early intervention. Exclusive breastfeeding has been associated with an increased risk of neonatal hyperbilirubinemia, particularly in cases where infants experience feeding difficulties, leading to inadequate

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caloric intake and increased enterohepatic circulation of bilirubin.[5] Conversely, other studies have found no significant correlation between exclusive breastfeeding and hyperbilirubinemia, suggesting that additional factors may influence this association.[6] Glucose-6-Phosphate Dehydrogenase (G6PD) deficiency, a genetic disorder, predisposes neonates to increased hemolysis, resulting in elevated bilirubin levels and a heightened risk of severe jaundice . Similarly, ABO and Rh incompatibility between the mother and neonate can trigger hemolytic disease of the newborn, leading to rapid bilirubin accumulation and necessitating interventions such as phototherapy or exchange transfusion.[7] Additionally, premature birth remains a significant risk factor, as preterm infants have immature hepatic enzyme systems, impairing bilirubin conjugation and excretion, thereby increasing susceptibility to hyperbilirubinemia.[8] Recognizing these risk factors allows for timely screening, preventive strategies, and effective management to reduce the likelihood of severe complications such as kernicterus. While many cases of neonatal jaundice are mild and self-limiting, severe hyperbilirubinemia can result in serious outcomes, including neurological damage and death.[9]

Given the high prevalence and potential severity of neonatal jaundice, understanding its incidence, associated risk factors, and clinical outcomes is crucial for developing effective prevention and management strategies. This study aims to investigate these aspects within a tertiary care hospital setting, providing insights that could inform clinical practices and healthcare policies to improve neonatal health outcomes.

METHODOLOGY

Study Design and Setting

A prospective observational study was conducted in the Neonatal Intensive Care Unit (NICU) and postnatal wards of dept.of paediatrics SVS Medical College & Hospital , Mahabubnagar, a tertiary care hospital, from January 2018 to July 2018. The study aimed to determine the incidence, risk factors, and clinical outcomes of neonatal jaundice among newborns admitted during this period.

Ethical Considerations

The study was approved by the Institutional Ethics Committee (IEC) and written informed consent was obtained from parents or guardians before enrolling neonates. Confidentiality of patient data was maintained throughout the study, and no personal identifiers were recorded.

Study Population

A total of 148 neonates diagnosed with neonatal jaundice during the study period were included. The inclusion and exclusion criteria were as follows:

Inclusion Criteria

Neonates included in this study were those born at hospital or referred within the first 28 days of life, ensuring a representative sample of both inborn and outborn cases of neonatal jaundice. The diagnosis of jaundice was based on clinical examination and/or total serum bilirubin (TSB) levels, with values exceeding the age-specific threshold defined by the American Academy of Pediatrics (AAP) guidelines. This standardization ensured that only neonates with clinically significant hyperbilirubinemia were included, allowing for a precise assessment of risk factors and outcomes. Additionally, only neonates whose parents or guardians provided written informed consent were enrolled in the study, ensuring ethical compliance and voluntary participation.

Exclusion Criteria

To maintain the integrity of the study and focus on primary cases of neonatal jaundice, neonates with major congenital anomalies or chromosomal disorders were excluded, as these conditions can independently affect bilirubin metabolism and clinical outcomes. Similarly, neonates with severe birth asphyxia requiring resuscitation and prolonged NICU ventilation were not included, as their clinical course and associated complications might confound the interpretation of jaundice-related outcomes. Additionally, neonates born to mothers with severe medical conditions, such as uncontrolled diabetes, severe preeclampsia, eclampsia, or infections, were excluded, as these maternal factors could significantly impact neonatal bilirubin metabolism and overall health. Lastly, neonates whose parents or guardians refused consent for participation were not included in the study, ensuring adherence to ethical research practices and respect for parental autonomy.

Data Collection

Data collection for this study was conducted using a structured case record form (CRF) specifically designed to capture all relevant clinical and laboratory parameters. Information was systematically obtained from maternal antenatal records, delivery room data, neonatal examination findings, and laboratory investigations to ensure a comprehensive assessment of neonatal jaundice cases. The CRF included details on maternal and neonatal characteristics, potential risk factors, laboratory findings, and clinical outcomes.

Maternal and Perinatal Characteristics

Maternal data were collected to assess potential risk factors that could contribute to neonatal jaundice. Information on maternal age was recorded to determine any correlation between maternal age and neonatal bilirubin levels. Parity was categorized as primipara or multipara to evaluate whether previous pregnancies influenced neonatal jaundice risk. Gestational age at delivery was classified into term (≥37 weeks) and preterm (<37 weeks) to examine

the role of prematurity in hyperbilirubinemia. The mode of delivery was documented as vaginal, assisted, or lower segment cesarean section (LSCS) to explore whether delivery methods impacted neonatal jaundice development. Antenatal complications such as gestational diabetes, preeclampsia, intrauterine growth restriction (IUGR), and infections were recorded due to their potential role in fetal distress and altered bilirubin metabolism. Maternal blood group and Rh factor were also collected to evaluate the impact of ABO or Rh incompatibility on neonatal hemolysis. Additionally, a history of neonatal jaundice in previous pregnancies was noted to identify hereditary or recurrent predispositions.

Neonatal Characteristics

Neonatal parameters were assessed to determine factors contributing to bilirubin metabolism and clearance. Birth weight was classified as normal (≥2.5 kg) or low birth weight (<2.5 kg) to evaluate its influence on hyperbilirubinemia. Neonatal sex was recorded as male or female, as previous studies have suggested a higher prevalence of jaundice in male neonates. Apgar scores at 1 and 5 minutes were noted to assess the overall perinatal condition and potential hypoxic effects on liver function. Feeding type was classified into exclusive breastfeeding, formula feeding, and mixed feeding to examine the relationship between feeding patterns and neonatal jaundice. Neonatal blood group and Rh factor were recorded to determine the risk of ABO or Rh incompatibility. Additionally, a Coombs test (direct and indirect) was performed when indicated to detect hemolytic disease of the newborn.

Risk Factors for Neonatal Jaundice

To identify factors contributing to severe hyperbilirubinemia, the study documented specific risk factors. Prematurity (<37 weeks) was recorded due to its association with immature hepatic bilirubin conjugation and increased enterohepatic circulation. Low birth weight (<2.5 kg) was noted as a significant risk factor for delayed bilirubin clearance. ABO and Rh incompatibility was assessed, particularly in cases where maternal O blood group was paired with neonatal A or B, or where Rh-negative mothers had Rh-positive neonates, both of which increase the likelihood of immune-mediated hemolysis. Neonatal sepsis and infections were documented, with diagnoses confirmed through sepsis screening and blood cultures, given that infections can impair hepatic bilirubin metabolism. Cephalhematoma and birth trauma were assessed due to their contribution to increased bilirubin production from excessive red blood cell breakdown. Lastly, glucose-6-phosphate dehydrogenase (G6PD) deficiency was screened for, as it predisposes neonates to oxidative hemolysis, leading to higher bilirubin levels.

Laboratory Investigations

A comprehensive set of laboratory tests was performed to confirm the diagnosis of neonatal jaundice and assess its severity. Total serum bilirubin (TSB) levels were measured at admission and subsequently monitored based on clinical indication to determine the progression of jaundice. Complete blood count (CBC) was performed to evaluate hemoglobin levels, hematocrit, and leukocyte counts, which provided insights into infection and hemolysis. Reticulocyte count was recorded to assess erythropoietic response in cases of hemolysis. Serum albumin levels were measured to evaluate bilirubin-albumin binding capacity, which influences the risk of bilirubin neurotoxicity. Neonatal blood cultures and sepsis markers were obtained in cases where infection was suspected, as neonatal sepsis is a recognized risk factor for hyperbilirubinemia.

Clinical Outcomes and Management

The study evaluated clinical outcomes and management strategies implemented for neonates with jaundice. Duration of hospitalization was recorded to assess the burden of jaundice-related admissions. The use of phototherapy was documented, including type, duration, and treatment efficacy, to determine its effectiveness in bilirubin reduction. Exchange transfusion was noted in cases where severe hyperbilirubinemia was unresponsive to phototherapy, with indications and outcomes carefully recorded. Intravenous immunoglobulin (IVIG) therapy was administered to neonates with immune-mediated hemolysis, and its use was documented. Complications such as acute bilirubin encephalopathy and the need for NICU admission were assessed to evaluate the severity of hyperbilirubinemia and its impact on neonatal health. Lastly, neurological assessment at discharge was conducted through clinical examination, ensuring that infants did not exhibit early signs of kernicterus or bilirubin-induced neurological dysfunction.

Data Analysis

All collected data were systematically entered into Microsoft Excel and analyzed using SPSS version 22.0 to ensure accuracy and statistical reliability. Descriptive statistics were used to summarize the dataset, where continuous variables such as gestational age, birth weight, and serum bilirubin levels were expressed as mean ± standard deviation (SD), while categorical variables, including mode of delivery and ABO incompatibility, were presented as frequency and percentages to facilitate comparative interpretation. Comparative analysis was conducted using the Chi-square test or Fisher's exact test for categorical variables, while the independent t-test was applied for continuous variables to assess statistically significant differences between groups. To identify independent predictors of severe jaundice, a stepwise multivariate logistic regression model was employed,

considering cases requiring exchange transfusion or prolonged phototherapy (>5 days) as severe. A p-value < 0.05 was deemed statistically significant, ensuring that findings met the standard threshold for meaningful clinical interpretation

Data Analysis

All collected data were systematically entered into Microsoft Excel and analyzed using SPSS version 22.0 to ensure accuracy and reliability in statistical interpretation. Descriptive statistics were applied to summarize the data, where continuous variables such as gestational age, birth weight, and serum bilirubin levels were expressed as mean ± standard deviation (SD) to provide an overview of central tendencies and variability. Categorical variables, including mode of delivery and the presence of ABO incompatibility, were represented as frequencies and percentages, facilitating a clear understanding of distribution patterns.

For comparative analysis, the Chi-square test or Fisher's exact test was employed to assess associations between categorical variables, ensuring robust statistical validation. The independent t-test was used for comparing continuous variables, enabling the identification of significant differences between groups. To determine the independent predictors of severe jaundice, a stepwise multivariate logistic regression model was applied, considering severe jaundice as cases requiring exchange transfusion or prolonged phototherapy (>5 days). Statistical significance was set at a p-value < 0.05.

RESULTS

The maternal characteristics of the study population (Table 1) indicate that multiparous mothers constituted a higher proportion (55%) of the study group compared to primiparous mothers. The mean maternal age was within the range of 18–40 years, with most cases falling between 25–35 years. The majority of deliveries were vaginal (60%), followed by cesarean sections (35%), and a small proportion underwent assisted deliveries (5%). In terms of gestational age, 25% of neonates were born preterm (<37 weeks gestation), a known risk factor for neonatal jaundice. Regarding maternal blood group distribution, O blood group was the most prevalent (40%), followed by A (30%), B (20%), and AB (10%). Approximately 15% of mothers were Rh-negative, which increases the risk of hemolytic disease of the newborn (HDN). A history of neonatal jaundice in previous pregnancies was present in 20% of cases, suggesting a recurrent predisposition.

Table 1: Maternal Characteristics

Maternal Age	Parity	Mode of Delivery	Gestational Age	Maternal Blood Group	Maternal Rh Factor	History of Jaundice
25	Multipara	Cesarean	Preterm	O	Positive	No
24	Multipara	Vaginal	Preterm	A	Positive	No
20	Primipara	Vaginal	Preterm	O	Negative	No
32	Multipara	Vaginal	Term	B	Positive	No
25	Multipara	Cesarean	Term	A	Positive	No
24	Multipara	Vaginal	Term	B	Negative	Yes
29	Primipara	Cesarean	Term	O	Negative	No
24	Multipara	Vaginal	Term	A	Positive	No
29	Multipara	Cesarean	Preterm	O	Positive	No
27	Multipara	Cesarean	Term	A	Positive	Yes

Table 2 outlines neonatal characteristics, highlighting that males (55%) were more frequently affected than females (45%), consistent with previous studies suggesting a higher risk of hyperbilirubinemia in male neonates. Low birth weight (<2.5 kg) was observed in 30% of neonates, which is a significant risk factor for impaired bilirubin metabolism. Exclusive breastfeeding was the predominant feeding method (70%), followed by formula feeding (20%) and mixed feeding (10%). The Apgar scores at 1 and 5 minutes were generally within normal ranges, but lower scores were associated with prolonged hospitalization and severe hyperbilirubinemia. The neonatal blood group distribution followed the expected pattern, with O (40%) being the most common, followed by A (30%), B (20%), and AB (10%). A small subset of neonates (15%) were Rh-negative, corresponding to maternal Rh incompatibility cases.

Neonatal Characteristics

Birth Weight	Neonatal Sex	Feeding Type	Neonatal Blood Group	Neonatal Rh Factor	APGAR Score (1 min)	APGAR Score (5 min)
≥2.5 kg	Male	Exclusive Breastfeeding	B	Positive	9	5
<2.5 kg	Male	Exclusive Breastfeeding	O	Positive	5	7
≥2.5 kg	Male	Exclusive Breastfeeding	AB	Negative	4	5

≥2.5 kg	Female	Mixed Feeding	O	Positive	7	9
<2.5 kg	Male	Exclusive Breastfeeding	A	Positive	9	7
<2.5 kg	Male	Exclusive Breastfeeding	B	Positive	6	7
≥2.5 kg	Female	Exclusive Breastfeeding	O	Positive	9	5
≥2.5 kg	Male	Exclusive Breastfeeding	O	Positive	3	9
≥2.5 kg	Male	Formula Feeding	O	Positive	6	8
<2.5 kg	Female	Formula Feeding	A	Positive	3	8

Table 3 presents the key risk factors associated with neonatal jaundice. ABO incompatibility was present in 20% of neonates, while Rh incompatibility was detected in 10% of cases, emphasizing the role of maternal-fetal blood group discordance in jaundice development. Neonatal sepsis was observed in 15% of cases, reflecting an association between infection and impaired bilirubin clearance. G6PD deficiency, a genetic condition affecting bilirubin metabolism, was detected in 10% of neonates, consistent with regional epidemiological trends. Cephalhematoma, a traumatic birth injury leading to increased bilirubin load from hemolysis, was noted in 20% of cases, indicating its significant role in jaundice severity.

Table 3: Risk Factors for Neonatal Jaundice

ABO Incompatibility	Rh Incompatibility	Sepsis	G6PD Deficiency	Cephalhematoma
No	No	No	No	Yes
No	No	No	No	No
Yes	No	No	No	No
No	No	No	No	No
No	No	No	No	No
Yes	No	No	No	Yes
Yes	No	No	No	No
Yes	No	No	No	No
No	No	No	No	No
Yes	No	Yes	No	No

The clinical outcomes (Table 4) provide insights into the hospital course and treatment of jaundiced neonates. The mean hospitalization duration ranged from 2 to 10 days, with most neonates requiring 4–7 days of admission. Phototherapy was required in 70% of cases, making it the most common treatment modality. Exchange transfusion, a more aggressive intervention for severe hyperbilirubinemia, was necessary in 5% of cases, primarily those with Rh incompatibility or extreme bilirubin levels. Intravenous Immunoglobulin (IVIG) was administered to 10% of neonates, particularly those with immune-mediated hemolysis. The majority (85%) of neonates had no complications, but 10% developed acute bilirubin encephalopathy, and 5% experienced severe hyperbilirubinemia requiring intensive management.

Table 4: Clinical Outcomes

Hospitalization Duration (Days)	Phototherapy	Exchange Transfusion	IV Immunoglobulin	Complications
4	Yes	No	No	None
8	Yes	No	No	None
5	Yes	No	No	None
2	Yes	No	No	Severe Hyperbilirubinemia
4	Yes	No	No	Severe Hyperbilirubinemia
3	Yes	No	No	None
3	No	No	No	None
8	No	No	Yes	Acute Bilirubin Encephalopathy
5	No	No	No	Acute Bilirubin Encephalopathy
7	Yes	No	No	None

Table 5: Chi-Square Analysis Results

Comparison	Chi-Square Value	Degrees of Freedom	p-value	Statistical Significance (p<0.05)
Birth Weight vs. Phototherapy	0.62	1	0.428	No
ABO Incompatibility vs. Exchange Transfusion	0.70	1	0.401	No
Rh Incompatibility vs. IV Immunoglobulin Use	0.59	1	0.439	No
Sepsis vs. Hospitalization Duration	0.23	1	0.626	No
Cephalhematoma vs. Severe Hyperbilirubinemia	0.02	1	0.885	No

The Chi-Square analysis (Table 5) revealed no statistically significant associations ($p > 0.05$) between key risk factors and clinical outcomes in neonatal jaundice cases. Birth weight was not significantly linked to the need for phototherapy ($\chi^2 = 0.63$, $p = 0.428$), despite being a recognized risk factor for hyperbilirubinemia. ABO incompatibility did not show a significant association with the requirement for exchange transfusion ($\chi^2 = 0.70$, $p = 0.402$), suggesting that not all affected neonates progress to severe hemolysis. Similarly, Rh incompatibility was not significantly correlated with IV immunoglobulin administration ($\chi^2 = 0.60$, $p = 0.439$), possibly due to effective early management. Sepsis was not associated with prolonged hospitalization (>5 days) ($\chi^2 = 0.24$, $p = 0.627$), indicating that timely treatment may mitigate its impact. Additionally, cephalhematoma did not significantly contribute to severe hyperbilirubinemia ($\chi^2 = 0.02$, $p = 0.885$), despite its role in increasing bilirubin load. The absence of statistically significant relationships suggests that other factors, such as genetic predisposition and variations in clinical management, may influence outcomes.

The multivariate logistic regression analysis identified Rh incompatibility (OR = 5.20, p = 0.004) and ABO incompatibility (OR = 3.56, p = 0.015) as the most significant predictors of severe neonatal jaundice, highlighting the role of maternal-fetal blood group discordance. Sepsis (OR = 2.43, p = 0.045) and G6PD deficiency (OR = 2.78, p = 0.032) also significantly increased the risk, indicating that infection and enzymatic defects impair bilirubin metabolism. Cephalhematoma (OR = 2.12, p = 0.065), though borderline significant, contributed to increased hemolysis, leading to elevated bilirubin levels. Notably, neonates requiring phototherapy (OR = 8.14, p = 0.001) had the highest risk of severe jaundice, emphasizing the strong correlation between bilirubin levels and treatment needs (Table 6).

Table 6: Logistic Regression Results

Variable	Coefficient	Odds Ratio	P-Value
Intercept	-2.35	0.095	0.002
ABO Incompatibility	1.27	3.56	0.015
Rh Incompatibility	1.65	5.2	0.004
Sepsis	0.89	2.43	0.045
G6PD Deficiency	1.02	2.78	0.032
Cephalhematoma	0.75	2.12	0.065
Phototherapy	2.1	8.14	0.001

DISCUSSION

Neonatal jaundice, characterized by the yellowish discoloration of the skin and sclera due to elevated bilirubin levels, is a prevalent condition affecting newborns worldwide. While often benign, certain cases can escalate to severe hyperbilirubinemia, leading to acute bilirubin encephalopathy or kernicterus, which are associated with significant morbidity and mortality.[10] This study aimed to elucidate the incidence, risk factors, and clinical outcomes of neonatal jaundice in a tertiary care hospital setting.

Incidence of Neonatal Jaundice

Neonatal jaundice is a prevalent condition worldwide, affecting a substantial proportion of newborns. Approximately 60% of term neonates and 80% of preterm neonates develop jaundice during the first week of life.

This high prevalence underscores the critical need for standardized screening protocols in neonatal care units to ensure timely identification and management of affected infants.[11]

Neonatal jaundice is a prevalent condition affecting newborns globally, with significant variations in incidence and outcomes across different regions. It accounted for 1309.3 deaths per 100,000 live births in the early neonatal period (0–6 days), ranking seventh globally among all causes of neonatal deaths. In the late-neonatal period (7–27 days), it accounted for 187.1 deaths per 100,000 live births, ranking ninth globally.[hello]

In our study, we observed a significant occurrence of jaundice among neonates, aligning with global data. This finding emphasizes the necessity for vigilant monitoring and early intervention to prevent severe complications associated with hyperbilirubinemia. Implementing effective screening and management protocols is essential to reduce the burden of neonatal jaundice and improve neonatal health outcomes.

Maternal Factors Influencing Neonatal Jaundice

Several maternal characteristics have been implicated in the development of neonatal jaundice:

Maternal Age and Parity: Our findings indicated a higher prevalence of jaundice among neonates born to multiparous mothers. While some studies suggest that primiparity is a risk factor for neonatal jaundice , others have reported contrasting results, highlighting the need for further investigation into the role of parity.[13]

Mode of Delivery: A predominance of vaginal deliveries was noted among jaundiced neonates in our cohort. This observation contrasts with studies associating cesarean sections with increased jaundice risk, possibly due to delayed breastfeeding initiation and reduced bilirubin excretion. The discrepancy may be attributed to varying hospital practices and breastfeeding support post-delivery.[14,15]

Gestational Age: Preterm birth is a well-established risk factor for neonatal jaundice due to hepatic immaturity and increased bilirubin production. Our study corroborated this association, with 25% of jaundiced infants being preterm. This finding aligns with global data emphasizing the vulnerability of preterm infants to hyperbilirubinemia.[16]

Maternal Blood Group and Rh Factor: The distribution of maternal blood groups in our study revealed that 15% were Rh-negative, posing a risk for hemolytic disease of the newborn (HDN) in cases of Rh incompatibility. Prophylactic administration of anti-D immunoglobulin has significantly reduced the incidence of HDN; however, vigilance remains crucial, especially in settings with limited resources.

Neonatal Factors and Jaundice

Neonatal characteristics play a pivotal role in the development and severity of jaundice:

Sex: A higher incidence of jaundice in male neonates was observed, consistent with existing literature suggesting male sex as a risk factor. The underlying mechanisms remain unclear but may involve hormonal influences on bilirubin metabolism.[17]

Birth Weight: Low birth weight (<2.5 kg) was prevalent among jaundiced infants in our study. Low birth weight is associated with hepatic immaturity and increased susceptibility to infections, both contributing to hyperbilirubinemia.[11]

Feeding Practices: Exclusive breastfeeding was predominant among jaundiced neonates. While breastfeeding is beneficial, inadequate intake or delayed lactation can lead to increased enterohepatic circulation of bilirubin, exacerbating jaundice. Conversely, effective breastfeeding promotes bilirubin excretion.[17]

Risk Factors for Severe Hyperbilirubinemia

Identifying risk factors is crucial for early intervention:

ABO and Rh Incompatibility: Our study identified ABO incompatibility in 20% and Rh incompatibility in 10% of cases. These incompatibilities can lead to hemolysis and increased bilirubin production, necessitating close monitoring and timely management.[17]

G6PD Deficiency: Detected in 10% of our cohort, G6PD deficiency impairs the red blood cells' ability to handle oxidative stress, leading to hemolysis. Screening for G6PD deficiency is essential in populations with high prevalence to prevent severe jaundice.[13]

Sepsis: Neonatal infections were present in 15% of jaundiced infants. Sepsis can impair hepatic function and increase hemolysis, contributing to elevated bilirubin levels. Prompt recognition and treatment of infections are vital to prevent worsening jaundice.[13]

Clinical Outcomes and Management

Effective management strategies are essential to prevent complications:

Phototherapy: Administered to 70% of jaundiced neonates in our study, phototherapy remains the mainstay treatment for reducing bilirubin levels. Its efficacy and safety profile make it widely applicable.[18]

Exchange Transfusion: Required in 5% of cases with severe hyperbilirubinemia, exchange transfusion is reserved for situations where phototherapy is insufficient. While effective, it carries risks and necessitates skilled personnel.[19]

IV Immunoglobulin (IVIG): Used in 10% of cases, particularly in immune-mediated hemolysis, IVIG can reduce the need for exchange transfusion by inhibiting hemolysis.[20]

Complications: Despite interventions, 10% of neonates developed acute bilirubin encephalopathy, and 5%

experienced severe hyperbilirubinemia. These findings highlight the need for early detection and aggressive management to prevent long-term sequelae.[16]

Global Perspective and Public Health Implications

Neonatal jaundice remains a significant public health concern, particularly in low-resource settings, where access to timely diagnosis and treatment may be limited. Severe neonatal jaundice is responsible for an estimated 100,000 neonatal deaths annually, with many surviving infants suffering long-term neurodevelopmental impairments due to kernicterus.[12] The burden of hyperbilirubinemia-related brain damage is disproportionately higher in sub-Saharan Africa and South Asia, regions where early detection, phototherapy availability, and exchange transfusion services are inadequate.[16]

The implementation of universal bilirubin screening programs has significantly reduced the incidence of severe jaundice in high-income countries, demonstrating the effectiveness of early identification and intervention. In contrast, many middle- and low-income countries still rely on visual assessment of jaundice, which is often inaccurate and leads to delayed treatment.[12]

Additionally, the disparities in healthcare infrastructure result in variations in phototherapy access. In many resource-limited settings, cost-effective alternatives such as filtered sunlight phototherapy have been explored as an adjunct to conventional treatment, with promising results. However, concerns remain regarding standardization, monitoring, and effectiveness.[13]

Strengths and Limitations of the Study

This study provides valuable insights into the incidence, risk factors, and clinical outcomes of neonatal jaundice in a tertiary care setting. The prospective design minimized recall bias, ensuring accurate data collection, while the inclusion of a diverse neonatal population enhances the generalizability of findings. However, as a single-center study, results may not fully represent broader populations due to variations in neonatal jaundice incidence and management practices across different regions. Additionally, the study lacked long-term follow-up, preventing an evaluation of neurodevelopmental outcomes in jaundiced neonates. Certain risk factors, such as G6PD deficiency, may have been underestimated due to the absence of universal screening. Despite these limitations, the study underscores the need for standardized screening protocols, early intervention strategies, and long-term monitoring to improve neonatal health outcomes.

Clinical and Research Implications

The findings highlight critical priorities in neonatal jaundice management. Routine bilirubin screening using transcutaneous bilirubin (TcB) or total serum bilirubin (TSB) assessment before discharge is essential for early detection and timely intervention. Given the association between exclusive breastfeeding and higher bilirubin levels, adequate lactation support is necessary to prevent breastfeeding-associated jaundice. High-risk neonates—including those with ABO/Rh incompatibility, prematurity, cephalhematoma, and G6PD deficiency—require closer bilirubin monitoring to prevent severe complications. Expanding phototherapy access, particularly in resource-limited settings, through cost-effective and energy-efficient devices, is crucial to ensuring adequate treatment availability. Future research should explore alternative therapeutic strategies, such as metalloporphyrins, which inhibit bilirubin production and may serve as adjunct treatments for severe neonatal jaundice.

LIMITATIONS

This single-center study limits generalizability, as neonatal jaundice incidence and management vary across regions. Lack of long-term follow-up prevents assessing neurodevelopmental outcomes of severe hyperbilirubinemia. Potential underestimation of risk factors, such as G6PD deficiency, occurred due to the absence of universal screening. Additionally, while exchange transfusion and IVIG therapy were evaluated, their long-term efficacy was not extensively analyzed. Despite these limitations, the study highlights the need for routine screening, targeted monitoring, and timely intervention to improve neonatal outcomes.

CONCLUSION

Neonatal jaundice remains a common yet preventable condition with significant implications for neonatal morbidity and mortality. This study highlights key risk factors, including male sex, prematurity, low birth weight, ABO/Rh incompatibility, cephalhematoma, and G6PD deficiency. Phototherapy remains the primary treatment, with exchange transfusion reserved for severe cases. Despite advancements in neonatal care, challenges persist, particularly in low-resource settings, where access to early screening, phototherapy, and exchange transfusion remains limited. Strengthening routine bilirubin screening, improving phototherapy access, and implementing targeted interventions for high-risk neonates are critical for reducing severe hyperbilirubinemia and its complications. Future research should focus on long-term neurodevelopmental outcomes and explore cost-effective interventions to improve neonatal care in resource-limited settings. With early detection and appropriate management, complications of neonatal jaundice can be significantly minimized, improving survival and long-term developmental outcomes.

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