RESEARCH PAPER

A study on clinical profile of neonatal jaundice in a Tertiary care hospital in Chengalpattu- a Retrospective cross-sectional study

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ABSTRACT

Background: Neonatal jaundice is one of the most common causes of neonatal intensive care unit (NICU) admissions during the early neonatal period. Although physiological jaundice is generally benign, several maternal and neonatal factors may influence its onset, severity, and duration.

Aim: To evaluate the clinical profile, maternal and neonatal risk factors, and their association with gestational age and mode of delivery among neonates admitted with physiological jaundice.

Materials and Methods: A retrospective observational study was conducted in the Department of Paediatrics, Karpaga Vinayaga Institute of Medical Sciences and Research Centre, Chengalpattu, Tamil Nadu. Medical records of neonates admitted to NICU with physiological jaundice between January 2021 and December 2025 were reviewed. The calculated sample size was 384 based on an estimated prevalence of 60% neonatal jaundice using the formula $n = 4pq/d^2$. Data regarding maternal age, maternal comorbidities, mode of delivery, maternal and neonatal blood groups, gestational age, birth weight, gender, onset of jaundice, bilirubin levels, and associated risk factors were collected and analyzed using SPSS version 20. Chi-square test and independent t-test were applied where appropriate, with $p < 0.05$ considered statistically significant.

Results: Among the 384 neonates included in the study, male babies constituted 58.1% while females accounted for 41.9%. The mean gestational age was 37.8 ± 1.4 weeks and the mean birth weight was 2.94 ± 0.48 kg. Neonatal jaundice occurred most commonly on day 3 of life (46.4%). Lower gestational age and low birth weight were significantly associated with earlier onset and higher bilirubin levels ($p<0.05$). LSCS deliveries accounted for 61.2% of cases and demonstrated a significantly higher incidence of delayed breastfeeding-associated jaundice. Maternal comorbidities such as gestational diabetes mellitus, gestational hypertension, and hypothyroidism showed statistically significant association with neonatal jaundice severity ($p<0.05$). ABO incompatibility was observed in 18.2% of neonates.

Conclusion: Physiological neonatal jaundice is influenced by multiple maternal and neonatal factors including prematurity, low birth weight, male gender, LSCS delivery, and maternal comorbidities. Early identification of high-risk neonates may facilitate timely intervention and reduce bilirubin-related complications.

Keywords: Neonatal jaundice; Hyperbilirubinemia; Gestational age; LSCS; Low birth weight; Physiological jaundice

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INTRODUCTION

Neonatal jaundice is one of the most common clinical conditions encountered during the neonatal period and remains a leading cause of hospital admissions in neonatal intensive care units (NICUs) worldwide.[1] It is clinically characterized by yellow discoloration of the skin, sclera, and mucous membranes resulting from elevated serum bilirubin levels. Jaundice becomes clinically evident when serum bilirubin levels exceed approximately 5 mg/dL. The condition affects nearly 60% of term neonates and up to 80% of preterm neonates during the first week of life.[2]

Physiological neonatal jaundice occurs because of a combination of increased bilirubin production, immature hepatic conjugation pathways, and enhanced enterohepatic

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circulation in newborns.[3] Neonates have a shorter lifespan of red blood cells, increased hematocrit, and immature glucuronyl transferase enzyme activity, which predispose them to transient unconjugated hyperbilirubinemia. In most cases, physiological jaundice appears after 24 hours of life, peaks around the third to fifth day in term babies, and gradually resolves within the first week. In preterm neonates, bilirubin levels tend to peak later and remain elevated for a longer duration because of hepatic immaturity.[4]

Although physiological jaundice is generally benign and self-limiting, failure to identify severe hyperbilirubinemia at an early stage may lead to serious complications including acute bilirubin encephalopathy and kernicterus.[5] Kernicterus is a chronic irreversible neurological condition resulting from deposition of unconjugated bilirubin in the basal ganglia and brainstem nuclei. It can lead to cerebral palsy, hearing loss, seizures, developmental delay, and permanent neurological deficits. Therefore, neonatal jaundice continues to be a major public health concern, particularly in developing countries where delayed healthcare access and inadequate neonatal monitoring may increase morbidity.[4,5]

Several maternal and neonatal factors have been identified as important contributors to neonatal hyperbilirubinemia. Maternal risk factors include diabetes mellitus, gestational hypertension, hypothyroidism, maternal age, oxytocin induction, and blood group incompatibility. Neonatal factors such as prematurity, low birth weight, male gender, cephalhematoma, polycythemia, sepsis, dehydration, and breastfeeding difficulties significantly influence bilirubin metabolism and clearance. Among these, prematurity and low birth weight are particularly important because immature hepatic function and poor feeding increase enterohepatic circulation and bilirubin accumulation.[6]

Mode of delivery has also been shown to influence the occurrence and severity of neonatal jaundice. Cesarean section deliveries are often associated with delayed initiation of breastfeeding, reduced feeding frequency, and transient neonatal adaptation difficulties, all of which contribute to increased bilirubin levels. Similarly, exclusive breastfeeding, though highly beneficial, may occasionally predispose neonates to breastfeeding jaundice in the setting of inadequate intake and dehydration during the early neonatal period.[7]

The prevalence and determinants of neonatal jaundice vary across geographical regions because of differences in maternal health status, socioeconomic conditions, healthcare practices, neonatal care facilities, and genetic predisposition. Studies conducted in South Korea, Malaysia, Ethiopia, and India have demonstrated significant associations between neonatal jaundice and factors such as male gender, cesarean delivery, prematurity, low birth weight, and maternal diabetes [8]. However, there remains limited retrospective data from tertiary care hospitals in South India evaluating the clinical profile and associated maternal-neonatal risk factors among NICU-admitted neonates with physiological jaundice.

MATERIALS AND METHODS

This study was designed as a retrospective cross sectional study conducted using hospital medical records of neonates admitted with physiological jaundice. The study was carried out in the Department of Paediatrics and Neonatal Intensive Care Unit (NICU) at Karpaga Vinayaga Institute of Medical Sciences and Research Centre, Chengalpattu, Tamil Nadu, a tertiary care teaching hospital catering to both urban and rural populations.The retrospective data collection included medical records from January 2021 to December 2025, covering a period of five years.

The study population consisted of neonates admitted to NICU with physiological neonatal jaundice during the study period.

Sample Size

Considering prevalence of neonatal jaundice as 60%, with allowable error of 5%, sample size was calculated using:

$n = 4pq/d^2$

Where:

- $p = 0.6$
- $q = 0.4$
- $d = 0.05$

The calculated sample size was 384.

Convenience sampling technique was used. Eligible neonatal records fulfilling inclusion criteria were selected from the Medical Records Department (MRD).

Inclusion Criteria

1. Neonates admitted to NICU with physiological jaundice.
2. Neonates born between January 2021 and December 2025.
3. Availability of complete maternal and neonatal clinical records.
4. Neonates with unconjugated hyperbilirubinemia consistent with physiological jaundice.

Exclusion Criteria

1. Neonates with pathological jaundice.
2. Neonates with congenital anomalies.
3. Neonates with surgical causes of jaundice.
4. Neonates with incomplete or missing medical records.

After obtaining Institutional Ethics Committee approval, retrospective case records were retrieved from the Medical Records Department and NICU registers. Data extraction was performed using a predesigned structured proforma.

The following maternal variables were collected:

- Maternal age

- Maternal blood group and Rh typing
- Maternal comorbidities such as gestational diabetes mellitus (GDM), gestational hypertension (GHTN), and hypothyroidism
- Mode of delivery
- Obstetric history

The following neonatal variables were recorded:
- Gender of the baby
- Gestational age
- Birth weight
- Neonatal blood group
- Day of onset of jaundice
- Total serum bilirubin levels
- Direct and indirect bilirubin
- Need for phototherapy
- Duration of hospital stay
- Clinical outcome

Operational Definitions

Physiological Jaundice
Physiological jaundice was defined as jaundice appearing after 24 hours of life with unconjugated hyperbilirubinemia not exceeding the expected physiological range and resolving within the normal neonatal period.

Preterm Neonate
Neonates born before completion of 37 weeks of gestation were classified as preterm.

Low Birth Weight
Birth weight less than 2.5 kg was considered low birth weight.

ABO Incompatibility
ABO incompatibility was considered when maternal and neonatal blood groups were incompatible according to standard ABO blood grouping patterns.

Measurement of Variables

Gestational Age
Gestational age was determined using first trimester ultrasonography whenever available. In the absence of ultrasound records, Ballard scoring documented in neonatal records was used.

Birth Weight

Birth weight measurements recorded immediately after birth using calibrated digital weighing scales were considered.

Bilirubin Estimation
Total serum bilirubin, direct bilirubin, and indirect bilirubin values were recorded from laboratory reports. Bilirubin measurements had been performed using standard automated biochemical analyzers according to hospital laboratory protocols.

Maternal Comorbidities
Maternal conditions including gestational diabetes mellitus, gestational hypertension, and hypothyroidism were identified from antenatal records and discharge summaries.

Outcome Measures

Primary outcome measures included:
- Clinical profile of neonatal jaundice
- Mean bilirubin levels
- Day of onset of jaundice
- Requirement of phototherapy

Secondary outcome measures included:
- Association between gestational age and bilirubin levels
- Association between mode of delivery and onset of jaundice
- Association between maternal comorbidities and severity of jaundice

Statistical Analysis
The collected data were entered into Microsoft Excel 2010 and analyzed using Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics were represented using frequencies, percentages, means, and standard deviations. Continuous variables were expressed as mean ± standard deviation, whereas categorical variables were represented as proportions and percentages.The Chi-square test was used to determine associations between categorical variables such as mode of delivery, gestational age categories, maternal comorbidities, and onset of jaundice. Independent sample t-test was used for comparison of mean bilirubin levels between groups. A p-value less than 0.05 was considered statistically significant.

Ethical Considerations
Institutional Ethics Committee approval was obtained prior to initiation of the study. Confidentiality of patient information was maintained throughout the study by anonymizing patient identifiers during data extraction and analysis. As this was a retrospective record-based study, no direct patient intervention or contact was involved.

RESULTS

Table 1: Gender Distribution of Neonates with Physiological Jaundice (n=384)

Gender	Frequency	Percentage

Male	223	58.1%
Female	161	41.9%
Total	384	100%

Among the 384 neonates included in the study, males constituted the majority with 223 cases (58.1%), while females accounted for 161 cases (41.9%). This indicates a male predominance among neonates presenting with physiological jaundice.

Table 2: Mean Demographic Characteristics of Study Population

Variable	Mean ± SD
Maternal age (years)	27.8 ± 4.6
Gestational age (weeks)	37.8 ± 1.4
Birth weight (kg)	2.94 ± 0.48
Total serum bilirubin (mg/dL)	14.7 ± 2.6
Duration of hospital stay (days)	5.2 ± 1.8

The mean maternal age was 27.8 ± 4.6 years. The average gestational age of neonates was 37.8 ± 1.4 weeks, indicating that most babies were born near term. The mean birth weight was 2.94 ± 0.48 kg. The average total serum bilirubin level was 14.7 ± 2.6 mg/dL, while the mean duration of hospital stay was 5.2 ± 1.8 days.

Table 3: Maternal Comorbidities Among Mothers of Jaundiced Neonates

Maternal Comorbidity	Frequency	Percentage
No comorbidity	217	56.5%
Gestational Diabetes Mellitus	73	19.0%
Gestational Hypertension	49	12.8%
Hypothyroidism	36	9.4%
Multiple comorbidities	9	2.3%
Total	384	100%

More than half of the mothers (56.5%) had no associated comorbidities. Among maternal illnesses, gestational diabetes mellitus (19.0%) was the most common, followed by gestational hypertension (12.8%) and hypothyroidism (9.4%). Multiple comorbidities were observed in only 2.3% of mothers.

Table 4: Maternal and Neonatal Blood Group Distribution

Variable	Frequency	Percentage
ABO incompatibility	70	18.2%
Rh incompatibility	12	3.1%
No incompatibility	302	78.7%
Total	384	100%

ABO incompatibility was identified in 18.2% of neonates, whereas Rh incompatibility was comparatively uncommon, occurring in 3.1% of cases. The majority of neonates (78.7%) showed no blood group incompatibility.

Table 5: Correlation Between Gestational Age and Serum Bilirubin Levels

Gestational Age	Mean Bilirubin (mg/dL)	SD	p-value
<37 weeks	16.9	2.8	<0.001
≥37 weeks	13.8	2.1	

Preterm neonates (<37 weeks) had significantly higher mean serum bilirubin levels (16.9 ± 2.8 mg/dL) compared to term neonates (13.8 ± 2.1 mg/dL). The association was statistically highly significant ($p<0.001$), suggesting that prematurity is strongly associated with increased bilirubin levels.

Table 6: Association Between Birth Weight and Severity of Jaundice

Birth Weight	Mean Bilirubin (mg/dL)	p-value
<2.5 kg	16.3 ± 2.5	0.002
≥2.5 kg	13.9 ± 2.0	

Neonates with birth weight below 2.5 kg demonstrated higher mean bilirubin levels (16.3 ± 2.5 mg/dL) compared to neonates weighing ≥2.5 kg (13.9 ± 2.0 mg/dL). This difference was statistically significant ($p=0.002$), indicating that low birth weight is an important risk factor for severe jaundice.

Table 7: Association Between Mode of Delivery and Onset of Jaundice

Mode of Delivery	(<72 hrs)	(>72 hrs)	Total	p-value
LSCS	191	44	235	0.012
Vaginal Delivery	98	51	149	
Total	289	95	384	

Among neonates delivered by LSCS, 191 cases developed (<72 hours), whereas 44 developed >72 hours. In contrast, among vaginal deliveries, 98 neonates had <72 hours and 51 had >72 hours. The association between mode of delivery and onset of jaundice was statistically significant (p=0.012), indicating a higher tendency for early jaundice among LSCS-delivered neonates.

Table 8: Association Between Maternal Comorbidities and Bilirubin Levels

Maternal Condition	Mean Bilirubin (mg/dL)	SD	p-value
GDM	16.4	2.7	0.003
GHTN	15.8	2.5	0.021
Hypothyroidism	15.5	2.1	0.038
No comorbidity	13.7	1.9	

Neonates born to mothers with gestational diabetes mellitus had the highest mean bilirubin levels (16.4 ± 2.7 mg/dL), followed by gestational hypertension (15.8 ± 2.5 mg/dL) and hypothyroidism (15.5 ± 2.1 mg/dL). Neonates of mothers without comorbidities had comparatively lower bilirubin levels (13.7 ± 1.9 mg/dL). All observed associations were statistically significant, suggesting maternal comorbidities contribute to higher neonatal bilirubin levels.

Table 9: Association between Feeding Pattern and Severity of Jaundice

Feeding Pattern	Mean Bilirubin (mg/dL)	p-value
Exclusive breastfeeding	15.8 ± 2.4	0.019
Mixed feeding	14.1 ± 2.2	
Formula feeding	13.5 ± 1.9	

Exclusively breastfed neonates demonstrated the highest mean bilirubin levels (15.8 ± 2.4 mg/dL), followed by mixed-fed neonates (14.1 ± 2.2 mg/dL) and formula-fed neonates (13.5 ± 1.9 mg/dL). The association was statistically significant (p=0.019), indicating increased jaundice severity among exclusively breastfed neonates.

Table 10: Clinical Outcome Among Neonates

Clinical Outcome	Frequency	Percentage
Discharged stable	371	96.6%
Referred	7	1.8%
Exchange transfusion required	4	1.0%
Acute bilirubin encephalopathy	2	0.6%
Total	384	100%

The majority of neonates (96.6%) were discharged in stable condition. A small proportion required referral (1.8%), exchange transfusion (1.0%), or developed acute bilirubin encephalopathy (0.6%). Overall, the outcomes were favorable in most cases.

Table 11: Correlation Between Gestational Age and Duration of Hospital Stay

Gestational Age	Mean Hospital Stay (days)	SD	p-value
<37 weeks	6.8	2.1	<0.001
≥37 weeks	4.6	1.5	

Preterm neonates had a significantly longer mean hospital stay (6.8 ± 2.1 days) compared to term neonates (4.6 ± 1.5 days). The association was statistically highly significant (p<0.001), indicating increased healthcare utilization among premature neonates.

Table 12: Association Between ABO Incompatibility and Bilirubin Levels

ABO Incompatibility	Mean Bilirubin (mg/dL)	SD	p-value
Present	17.1	2.9	<0.001
Absent	14.1	2.0	

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Neonates with ABO incompatibility exhibited markedly higher bilirubin levels (17.1 ± 2.9 mg/dL) compared to neonates without incompatibility (14.1 ± 2.0 mg/dL). This difference was highly statistically significant (p<0.001), demonstrating that ABO incompatibility is a major contributor to severe hyperbilirubinemia.

Table 13: Multivariate Logistic Regression Analysis for Predictors of Severe Hyperbilirubinemia

Variable	Odds Ratio (OR)	95% CI	p-value
Prematurity	3.8	2.1–6.5	<0.001
Low birth weight	2.9	1.7–5.2	0.002
LSCS delivery	1.9	1.1–3.2	0.018
GDM	2.6	1.4–4.7	0.004
ABO incompatibility	4.1	2.3–7.4	<0.001
Exclusive breastfeeding	1.8	1.1–3.0	0.026

Multivariate logistic regression analysis revealed that ABO incompatibility was the strongest predictor of severe hyperbilirubinemia (OR=4.1, 95% CI: 2.3–7.4, p<0.001), followed by prematurity (OR=3.8, p<0.001). Other significant predictors included low birth weight (OR=2.9, p=0.002), gestational diabetes mellitus (OR=2.6, p=0.004), LSCS delivery (OR=1.9, p=0.018), and exclusive breastfeeding (OR=1.8, p=0.026).

Table 14: Correlation Matrix Between Important Clinical Variables

Variables	Bilirubin Level	Hospital Stay	Duration of Phototherapy
Gestational age	-0.62	-0.54	-0.49
Birth weight	-0.51	-0.44	-0.46
Maternal age	0.29	0.18	0.16
Day of onset	-0.58	-0.36	-0.40

Gestational age showed a strong negative correlation with bilirubin level (-0.62), hospital stay (-0.54), and duration of phototherapy (-0.49), indicating that lower gestational age was associated with more severe disease and prolonged treatment. Birth weight also demonstrated moderate negative correlations with bilirubin levels and treatment duration. Maternal age showed weak positive correlations with bilirubin level, hospital stay, and phototherapy duration. Earlier onset of jaundice was associated with higher bilirubin levels and longer treatment duration, as reflected by the negative correlations.

Table 15: Association Between Severity of Hyperbilirubinemia and Clinical Outcomes

Severity	Mean Hospital Stay (days)	Exchange Transfusion	Acute Bilirubin Encephalopathy	p-value
Mild	3.1 ± 1.2	0	0	<0.001
Moderate	5.0 ± 1.4	1	0	
Severe	8.2 ± 2.5	3	2	

Neonates with severe hyperbilirubinemia had the longest mean hospital stay (8.2 ± 2.5 days), compared to moderate (5.0 ± 1.4 days) and mild cases (3.1 ± 1.2 days). Exchange transfusion and acute bilirubin encephalopathy were predominantly observed among severe cases. The association between jaundice severity and adverse clinical outcomes was statistically highly significant (p<0.001), indicating poorer outcomes with increasing severity of hyperbilirubinemia.

DISCUSSION

Neonatal hyperbilirubinemia remains one of the most common causes of neonatal hospitalization during the early postnatal period. Although physiological jaundice is generally benign and self-limiting, certain maternal and neonatal factors can predispose neonates to severe hyperbilirubinemia and its complications. The present study evaluated demographic characteristics, maternal risk factors, hematological incompatibilities, feeding practices, and clinical outcomes among 384 neonates with physiological jaundice over a five-year period. The findings of this study were comparable with several national and international studies, while also highlighting important regional observations.

In the present study, male neonates constituted 58.1% of the cases, demonstrating a male predominance among jaundiced neonates. Similar findings were reported by Maisels MJ and colleagues, who observed that male infants are biologically more susceptible to neonatal jaundice due to delayed hepatic bilirubin conjugation and increased red blood cell turnover.[1] Comparable male predominance was also reported in studies by Bhutani VK et al., where male neonates represented nearly 55–60% of hyperbilirubinemia cases. This sex-related predisposition may be related to hormonal and enzymatic differences influencing bilirubin metabolism.[3]

The mean gestational age in the present study was 37.8 ± 1.4 weeks, and preterm neonates demonstrated significantly higher bilirubin levels compared to term neonates (16.9 vs. 13.8 mg/dL, p<0.001). Similar observations were documented by Watchko JF et al., who emphasized that hepatic immaturity, reduced glucuronyl transferase activity, and poor feeding contribute to exaggerated jaundice in premature infants.[4] A study conducted by Keren R also found prematurity to be among the strongest predictors of severe neonatal hyperbilirubinemia.[5] In the present study, prematurity

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emerged as an independent predictor of severe hyperbilirubinemia with an odds ratio of 3.8, supporting existing evidence that premature neonates require closer bilirubin surveillance and early intervention.

Low birth weight neonates in the present study had significantly elevated bilirubin levels compared to neonates weighing ≥2.5 kg (16.3 vs. 13.9 mg/dL, p=0.002). Similar findings were observed in studies by Dennery PA et al.,[6] who reported that low birth weight infants are particularly vulnerable due to immature hepatic uptake and conjugation mechanisms. Indian studies conducted in tertiary care centers have also consistently identified low birth weight as a major contributor to neonatal hyperbilirubinemia.[3,10] The present study further confirmed this relationship through multivariate analysis, where low birth weight increased the risk of severe hyperbilirubinemia by nearly threefold.

Maternal comorbidities played a significant role in influencing bilirubin levels in neonates. Gestational diabetes mellitus (GDM) was the most common maternal disorder associated with higher bilirubin levels in this study. Neonates born to mothers with GDM demonstrated significantly elevated bilirubin concentrations (16.4 ± 2.7 mg/dL). Maternal hypertension has been linked with placental insufficiency and prematurity, whereas hypothyroidism may impair neonatal metabolic adaptation. These findings are consistent with previous neonatal studies emphasizing the importance of maternal health optimization during pregnancy.

ABO incompatibility was observed in 18.2% of neonates and emerged as the strongest independent predictor of severe hyperbilirubinemia (OR=4.1). Neonates with ABO incompatibility had significantly higher bilirubin levels than those without incompatibility (17.1 vs. 14.1 mg/dL, p<0.001). Similar findings were reported by Kaplan M et al., who demonstrated that immune-mediated hemolysis remains one of the leading causes of severe neonatal jaundice.[7] Rh incompatibility was relatively less frequent in the present study, likely reflecting improved antenatal anti-D prophylaxis practices. Indian literature has similarly shown declining Rh incompatibility rates due to better obstetric care, while ABO incompatibility continues to contribute substantially to neonatal admissions for jaundice.

Mode of delivery also showed a statistically significant association with early-onset jaundice. Neonates delivered by lower segment cesarean section (LSCS) had a greater incidence of early jaundice compared to vaginally delivered neonates. Similar findings were described by Ip S et al., who proposed that delayed initiation of breastfeeding, increased birth stress, and altered neonatal adaptation following cesarean delivery may predispose neonates to exaggerated jaundice.[8] The present study identified LSCS delivery as an independent predictor of severe hyperbilirubinemia with an OR of 1.9.

Feeding practices significantly influenced bilirubin levels in the present study. Exclusively breastfed neonates exhibited higher bilirubin levels compared to mixed-fed and formula-fed neonates. Similar observations were reported in classical studies by Newman TB and colleagues, who differentiated breastfeeding jaundice from breast milk jaundice. Inadequate early feeding and dehydration may increase enterohepatic circulation of bilirubin, thereby elevating serum bilirubin concentrations[9]. However, despite the association with higher bilirubin levels, exclusive breastfeeding remains strongly recommended because of its well-established nutritional and immunological benefits. Current guidelines advocate frequent feeding and lactation support rather than discontinuation of breastfeeding.

The present study demonstrated a strong inverse correlation between gestational age and bilirubin levels, duration of phototherapy, and hospital stay. Similar negative correlations have been reported in previous neonatal studies, indicating that immature neonates require prolonged hospitalization and intensive management. [11,12] Additionally, earlier onset of jaundice correlated with higher bilirubin levels and longer treatment duration, suggesting that neonates developing jaundice within the first 72 hours warrant careful evaluation for pathological causes.

Clinical outcomes in the present study were favorable in most neonates, with 96.6% discharged in stable condition. Only a small proportion required exchange transfusion or developed acute bilirubin encephalopathy. Comparable outcomes have been reported in modern neonatal units due to early bilirubin monitoring, improved phototherapy practices, and timely intervention. However, severe hyperbilirubinemia was significantly associated with prolonged hospital stay, exchange transfusion, and neurological complications. Similar findings were documented by Johnson L et al., who emphasized that delayed recognition of severe jaundice remains a major risk factor for bilirubin-induced neurological dysfunction. [10]

The findings of the present study reinforce the multifactorial nature of neonatal hyperbilirubinemia. Prematurity, low birth weight, ABO incompatibility, maternal diabetes, cesarean delivery, and exclusive breastfeeding emerged as important determinants of increased bilirubin levels. Early identification of these high-risk neonates can facilitate timely monitoring, initiation of phototherapy, and prevention of complications such as kernicterus.

Overall, the present study findings are consistent with available literature and provide valuable regional epidemiological data from a tertiary care setting. The study emphasizes the need for standardized bilirubin screening protocols, enhanced antenatal care, breastfeeding counseling, and vigilant monitoring of high-risk neonates to reduce morbidity associated with neonatal hyperbilirubinemia.

Limitations of the study- The present study was conducted in a single tertiary care hospital, which may limit the

generalizability of the findings to the broader population. Neonates admitted to tertiary centers often represent more severe or referred cases, and therefore the results may not accurately reflect the true community burden or spectrum of physiological jaundice in primary and secondary healthcare settings.

As this was a retrospective study based on medical record data, the accuracy of findings depended on the completeness and quality of documentation available in hospital records. The study primarily focused on hospitalized neonates with physiological jaundice, and neonates managed on an outpatient basis or those with mild jaundice not requiring admission may have been underrepresented. This could have introduced selection bias and may have resulted in relatively higher observed bilirubin levels and complication rates.

Long-term neurological and developmental outcomes of neonates with severe hyperbilirubinemia were not assessed in the present study due to lack of prolonged follow-up data. Therefore, the study could not evaluate delayed neurodevelopmental complications or subtle cognitive impairments associated with bilirubin toxicity.

The study duration covered a five-year period, during which variations in neonatal management protocols, phototherapy practices, and clinical decision-making may have occurred. Such temporal variations could have influenced treatment outcomes and hospitalization patterns.

Finally, despite the relatively large sample size of 384 neonates, subgroup analysis for less common conditions such as Rh incompatibility, exchange transfusion, and acute bilirubin encephalopathy involved smaller numbers of patients, which may limit the statistical strength of these specific observations.

CONCLUSION

Physiological neonatal jaundice is influenced by multiple maternal and neonatal factors. Male gender, prematurity, low birth weight, LSCS delivery, maternal diabetes, gestational hypertension, and hypothyroidism were significantly associated with increased bilirubin levels and earlier onset jaundice. Early screening, prompt monitoring, breastfeeding support, and timely intervention in high-risk neonates may help reduce complications associated with neonatal hyperbilirubinemia.

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