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Prevalence of Hyperbilirubinemia Among Inborn Neonates Admitted to a Tertiary NICU in the Central Terai Region of Nepal

Dr. Shekhar Maan Shrestha[1*]; Samiksha Acharya[2]; Yograj Sharma[3]; Bishal Bhandari[4]; Sulav Neupane[4]; Gaurav Rawal[4]; Dikshya Giri[2]; Tanuja Magar[5]

[1]Bir Hospital, Mahaboudha, Kathmandu, Nepal
[2]Chitwan Om Hospital, Bharatpur, Chitwan, Nepal
[3]Bharatpur Hospital, Bharatpur, Chitwan, Nepal
[4]Birendra Army Hospital, Chauni, Kathmandu, Nepal
[5]Tilganga Institute of Ophthalmology, Ringroad, Kathmandu, Nepal

Corresponding Author: Dr. Shekhar Maan Shrestha[1*]

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Abstract:

- ***Introduction:***
Neonatal hyperbilirubinemia is among the most common health problems of newborns, especially in resource-limited settings like Nepal. Limited treatment access and delayed diagnosis increase the risk of having severe complications. This study aimed to assess the prevalence of neonatal jaundice in a tertiary Neonatal Intensive Care Unit (NICU) in Central Terai belt of Nepal.

- ***Methods:***
A descriptive cross-sectional study was conducted at a tertiary care centre from February 13 to December 16, 2024, after obtaining ethical approval from the Institutional Review Committee. Neonates admitted to the NICU with bilirubin ≥7 mg/dL in serum were included. Data were collected from 515 neonates, using an Excel sheet, and analyzed using SPSS v26.0. 95% Confidence Interval and point estimate accordingly were calculated. Convenience sampling was used.

- ***Results:***
Among 515 admitted neonates in the NICU, Hyperbilirubinemia was present in 175 (33.98%). Most of them were males (67.4%) and preterms (41.7%). Sepsis (38.29%), ABO incompatibility (22.29%), and birth asphyxia (16.57%) were found to be the leading causes. Phototherapy was administered in 90.29% of cases, with a median duration of 26 hours. Exchange transfusion was required in 2.29% of cases. After treatment, median total serum bilirubin decreased from 12.4 to 11.1 mg/dL. Most neonates (87.4%) recovered and were discharged.

- ***Conclusions:***
The prevalence of hyperbilirubinemia among neonates was found to be lower in comparison to other studies done in similar settings. However, Sepsis and ABO incompatibility were still observed to be key contributors. Early diagnosis improved antenatal care, and access to effective treatment, like phototherapy and exchange transfusion were crucial to reduce morbidity and mortality.

Keywords: *Neonatal Jaundice; Hyperbilirubinemia; Sepsis; Blood Group Incompatibility; Phototherapy*

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I. INTRODUCTION

Hyperbilirubinemia is a common condition in newborns, affecting about 60% of full-term babies and 80% of preterm babies around the globe.[1,2] Every year, there are around 1.1 million cases of severe hyperbilirubinemia, especially in places like sub-Saharan Africa and South Asia, where not having enough healthcare makes things worse.[3,4] In the context of Nepal, the prevalence of neonatal jaundice is 39.85% of babies in the NICU, thus leading to high neonatal morbidity and mortality.[5]

Excessive Unconjugated bilirubin can be harmful to the brain and might cause kernicterus, hearing loss, and problems with development.[6-9] Phototherapy is the main treatment,[10] but nearly 6 million newborns don't have access to it, particularly in South Asia.[11,12] Exchange transfusion is very important for severe cases, but it is often not available in areas with limited resources, highlighting how crucial it is to detect and treat these issues early to avoid permanent damage.[13]

This study aimed to find out how common hyperbilirubinemia is among newborns in the NICU of a tertiary-care centre in Nepal, to come up with guided interventions to reduce morbidity and mortality.

II. METHODS

A descriptive cross-sectional study was conducted to determine the prevalence and aetiology of jaundice in neonates admitted to the Neonatal Intensive Care Unit (NICU) of Bharatpur Hospital, Chitwan, Nepal. Data collection took place from 15 Jan 2024 to 21 Jan 2024, following ethical approval from the Institutional Review Committee (IRC) of Bharatpur Hospital, Nepal. All of the newborns who were admitted to the NICU with serum bilirubin ≥7 mg/dl were included in this study, and neonates whose parents refused to take part in the study were excluded. Convenience sampling was employed, and the minimum sample size was calculated as 369 using the formula:

$$n = (Z^2 \times \frac{p \times q}{e^2})$$

$$= (1.96^2 \times \frac{0.3985 \times 0.6015}{0.05^2})$$

$$= 369$$

Where,

N represents the minimum required sample

Z represents the 1.96 at 95% Confidence Interval

p represents the prevalence of hyperbilirubinemia among neonates in NICU taken as 39.85%[5]

q represents 1-p

e represents margin of error, 5%.

The minimum required sample size was calculated to be 369. However, a total of 515 neonates admitted to the NICU were included in the study.

Data was collected from the NICU Report Sheet, Bilirubin Monitoring Chart, Phototherapy Log, Exchange Transfusion Record, and other relevant medical records using the predesigned proforma. Mother's demographic, including age, address, Week of Gestation, mode of delivery, mother's blood group, complications during pregnancy, and number of ANC visits, were recorded with the help of a questionnaire. Previously recorded Details of neonates were extracted in terms of Following namely: age, sex, birth weight, APGAR Score at 1 and 5 minutes, neonatal age at the time of admission, baby's blood group, Total serum bilirubin and Direct serum bilirubin before and after phototherapy, duration of phototherapy, exchange transfusion if needed, days of NICU stay, common aetiological factors like sepsis, birth asphyxia, polycythaemia, ABO, Rh Incompatability and outcomes.

Data were entered into Microsoft® Excel for Mac Version 16.95.4 (25040241) and were verified for completeness. Statistical analysis was performed using IBM SPSS v26.0.0.0. Point estimates and 95% confidence intervals were calculated. All normally distributed data were reported using mean and Standard Deviation, Frequencies were reported using frequency and percentage, and all skewed data were reported using median and Interquartile Ranges (IQR).

III. RESULTS

A. Baseline Characteristics of the Cohort

Out of 515 neonates admitted in the NICU from 13 February 2023 to 17 November 2023, hyperbilirubinemia was found in 175 neonates (33.98%) (29.9 - 38.3, 95% CI). The Mean maternal age was recorded to be 26.62 ± 5.45 years. 79 (45.1%) mothers were less than 25 years of age, 82 (46.9%) were from 25 to 35 years of age, and 14 (8.0%) were greater than 35 years of age. Majority of mothers had O Positive Blood 76 (43.4%), followed by B Positive 42 (24.0%), A Positive 35 (20.0%), AB Positive 9 (5.1%), A Negative 6 (3.4%), B Negative 3 (1.7%), AB Negative 2(1.1%) & O Negative 2 (1.1%) Blood.

B. Neonatal Parameters

Among the 175 recorded neonates with hyperbilirubinemia, 57 (32.6%) were female and 118 (67.4%) were male babies. 73 (41.7%) were preterm (<37 weeks), 51 (29.1%) were term, and 51(29.1%) were post-term babies according to weeks of gestation. The average birth weight was found to be 2700 g (± 803.43). The Median APGAR recorded at 1 min was 6 (IQR: 5–7) and at 5 min was 7 (IQR: 7–8). More neonatal characteristics among neonates admitted to the NICU are shown in Table 1.

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Table 1 Neonatal characteristics among neonates admitted to NICU (n= 175)

Characteristics	Category	Frequency	Percentage
Gender of baby	Female	57	32.6
	Male	118	67.4
Birth weight	LBW	76	43.4
	Normal	95	54.3
	Macrosomia	4	2.3
Age at admission (hours of life)	<24 hours	131	74.9
	24-72 hours	32	18.3
	>72 hours	12	6.9
Modes of delivery	NVD	88	50.3
	LSCS	81	46.3
	VAD	6	3.4
Week of gestation	Preterm	73	41.7
	Term	51	29.1
	Postterm	51	29.1
Baby's blood group	A positive	49	28
	A negative	1	0.6
	B positive	57	32.6
	B negative	2	1.1
	Ab positive	13	7.4
	O positive	53	30.3
Total		175	100

C. Clinical Presentation at Admission

Median Total Serum Bilirubin at Admission was 12.4 mg/dL (Range: 10.23–14.35). Out of total admission, 131 (74.9%) presented with hyperbilirubinemia within 24 hours of life, 32(18.3%) presented between 24 to 72 hours, and 12(6.9%) presented beyond 72 hours of Life. Total serum bilirubin at first recording for male and female babies was 13.26 (±3.89) and 11.87 (±3.69), respectively. Clinical profile of hyperbilirubinemic patients (n = 175) is shown in Table 2.

Table 2 Clinical profile of hyperbilirubinemic patient (n= 175)

	Characteristics	Frequency	Percentage
Etiology	Presence of sepsis	67	38.29
	Rh Incompatability	12	6.86
	ABO Incompatability	39	22.29
	Breast milk Jaundice	4	2.29
	Polycythemia	5	2.86
	cephalohematoma	2	1.14
	sickle cell anemia	3	1.71
	Birth Asphyxia	29	16.57
	Diabetic Mother	12	6.86
	others	2	1.14
Intervention	Phototherapy	158	90.29
	Antibiotic given or not?	69	39.43
	Blood Exchange Transfusion	4	2.29

D. Treatment Details

Phototherapy was provided to 158 (90.29%) Patients. The Median duration was 26 hours (IQR: 23–48). Out of 158 who received phototherapy, 95 (60.13%) achieved TSB2 <15 mg/dL. Exchange Transfusion was required in 4 (2.3%) of the total cases. After Treatment Median Total Serum Bilirubin decreased from 12.4 (10.23–14.35) to 11.1 mg/dL (9.1–13.5)

E. Maternal & Pregnancy Factors

Phototherapy 94 (53.7%) of antenatal visits were less than 4 times, and 81(46.3%) were more than four visits. All major maternal complications of pregnancy are listed in Table 3.

Table 3 Maternal Complications of Pregnancy (n= 175)

	Characteristics	Frequency	Percentage
Complications	Urinary Tract Infection	20	11.4
	Oligohydramnios	11	6.3

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	Gestational Diabetes Mellitus	8	4.6
	Meconium Aspiration Syndrome	7	4
	Thick Meconium-Stained Liquor	7	4
	Pregnancy-Induced Hypertension	4	2.3
	Syphilis	4	2.3
	Preeclampsia	2	1.1
	Chorioamnionitis	1	0.6
	Eclampsia	1	0.6

F. Outcomes & Follow-Up

Median NICU Stay was 6 days (IQR: 4–9). 153 [87.4] % of 175 admitted patients were discharged healthy.

IV. DISCUSSION

Our research provided a detailed look at neonatal hyperbilirubinemia by studying the results from a group of 175 newborns, admitted to the NICU over a nine-month timeframe. The results reveal the prevalence of hyperbilirubinemia, the aetiological perspective of it, and how it can be treated.

The prevalence of Hyperbilirubinemia Among Inborn Admitted Neonates to the NICU in our study was found to be 33.98%. It was low when we compared it to the prevalence from a study done at the NICU of Nepalgunj Medical College Teaching Hospital, in December 2020, which was 39.85%.[5] This showed a decreasing trend of Hyperbilirubinemia in our setting. Most of the affected babies in our study were boys (67.4%), which is consistent with previous studies suggesting male infants are more likely to be affected.[14,15] Additionally, a notable number of the newborns were preterm (41.7%), highlighting the known link between being born early and having hyperbilirubinemia due to their underdeveloped liver functions.[13]

When looking at the mothers' blood types, O-positive (43.4%) was the most common, followed by B-positive (24%). This could relate to jaundice caused by ABO incompatibility. However, only 22.29% of the cases were due to ABO incompatibility, and 6.86% were linked to Rh incompatibility, indicating that other causes are more significant in this group. The main cause of hyperbilirubinemia in our study was found to be Sepsis (38.29%), followed by ABO incompatibility (22.29%) and birth asphyxia (16.57%). Therefore, there is a need for infection screening in babies with hyperbilirubinemia, especially in limited-resource areas, where sepsis is a major cause of health problems in newborn babies.

Phototherapy was the main treatment used, accounting for 90.29% of cases, with an average treatment time of 26 hours. About 60.13% of the newborns treated reached a total serum bilirubin (TSB) level below 15 mg/dL. There was a drop in median TSB from 12.4 mg/dL to 11.1 mg/dL after treatment, thus highlighting the efficacy of the phototherapy. More than half of the mothers (53.7%) had fewer than four prenatal visits, indicating a possible lack of prenatal care that could affect the health of their newborns. Some maternal health issues, like urinary tract infections (11.4%), oligohydramnios (6.3%), and gestational diabetes (4.6%), were observed, possibly resulting in higher neonatal sepsis.

Our study was conducted at a single center and was retrospective and descriptive in nature. The study duration was short, and a convenient sampling method was used. Therefore, the prevalence obtained from this study may not reflect the overall burden of Neonatal Hyperbilirubinemia in a larger population, thus limiting the generalizability. Long-term neurodevelopmental outcomes were not assessed, or no causability effects were established, which would be valuable in understanding the impact of severe hyperbilirubinemia.

V. CONCLUSIONS

The prevalence of hyperbilirubinemia in this study was lower than in previous studies done in a similar setting. This study highlighted the significant burden of neonatal hyperbilirubinemia in the NICU, with sepsis and ABO incompatibility being major contributors. The findings also supported the effectiveness of phototherapy in most cases, while emphasizing the need for early diagnosis and comprehensive maternal-neonatal care to reduce adverse outcomes. Early Screening & Timely Intervention are required to decrease the morbidity. A strong infection prevention protocol needs to be implemented. Educating mothers about the signs of neonatal jaundice could help with earlier detection and treatment. Phototherapy and exchange transfusion should be made readily available. Future research should explore longitudinal outcomes and additional risk factors to refine management protocols further.

Conflict of Interest: None.

Financial Disclosure: None

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