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A Cross-Sectional Study on Prevalence and Risk Factors for Neonatal Jaundice in Paediatric Group Admitted in a Tertiary Care Centre of West Bengal

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ABSTRACT

Background: Neonatal jaundice (neonatal hyperbilirubinaemia) remains one of the most common clinical conditions encountered in the neonatal period, particularly in developing countries like India. It constitutes a significant cause of neonatal morbidity and, if left untreated, can lead to serious neurological complications including kernicterus. This study aimed to determine the prevalence and identify key risk factors associated with neonatal jaundice among neonates admitted to a tertiary care centre in West Bengal. **Methods:** A hospital-based cross-sectional study was conducted over a period of six months in the Paediatrics Department of a tertiary care centre in West Bengal. A total of 64 neonates who satisfied the inclusion criteria were enrolled using a systematic random sampling technique. Relevant sociodemographic and clinical data were collected using a structured proforma. Serum bilirubin levels were estimated for all neonates.**Results:** Out of 64 neonates studied, jaundice was clinically significant in 45 cases (70.3%). The majority of affected neonates were male (62.2%), term neonates (71.1%), and born via normal vaginal delivery (55.6%). ABO incompatibility (31.1%), prematurity (24.4%), and sepsis (20.0%) were found to be the most common risk factors. Exclusively breastfed neonates showed a higher prevalence of jaundice (46.7%). Mothers belonging to lower socioeconomic status accounted for 53.3% of cases. **Conclusion:** Neonatal jaundice is highly

prevalent in this region, with ABO incompatibility, prematurity, and birth-related factors emerging as principal risk factors. Early identification and timely intervention through phototherapy and close monitoring are essential to reduce associated morbidity.

Keywords: *Neonatal jaundice, hyperbilirubinaemia, risk factors, ABO incompatibility, West Bengal, tertiary care centre, cross-sectional study.*

1. INTRODUCTION

Neonatal jaundice, also referred to as neonatal hyperbilirubinaemia, is defined as the yellowish discolouration of the skin and sclera in a neonate due to elevated levels of bilirubin in the blood. It is the most frequently encountered clinical problem during the first week of life. The condition is physiological in the majority of cases; however, a significant proportion may have pathological jaundice requiring prompt medical attention[1].

Globally, it is estimated that approximately 60% of term neonates and 80% of preterm neonates develop jaundice during the first week of life. In India, neonatal jaundice contributes to approximately 6–10% of neonatal hospital admissions and is responsible for a substantial proportion of neonatal mortality and morbidity, particularly in resource-limited settings. West Bengal, being a densely populated state with a significant rural population and limited access to skilled obstetric care in remote areas, presents a unique epidemiological burden[2].

The aetiology of neonatal jaundice is multifactorial. Known risk factors include prematurity, ABO and Rh blood group incompatibility, neonatal sepsis, glucose-6-phosphate dehydrogenase (G6PD) deficiency, exclusive breastfeeding, birth asphyxia, polycythaemia, cephalhaematoma, and low birth weight. Sociodemographic factors such as maternal age, parity, socioeconomic status, and mode of delivery have also been implicated in the literature[3].

Untreated severe hyperbilirubinaemia can lead to bilirubin-induced neurological dysfunction (BIND), culminating in acute bilirubin encephalopathy or the chronic irreversible condition known as kernicterus. Given the preventable nature of these sequelae, it is important to identify and monitor at-risk neonates early[4].

Despite the widespread recognition of the condition, there remains a paucity of robust institutional data from tertiary care centres in West Bengal. This study was therefore designed to assess the prevalence and evaluate the risk factors for neonatal jaundice among neonates admitted to a tertiary care centre, thereby contributing to region-specific data which can guide clinical decision-making and public health planning.

2. OBJECTIVES

Primary Objective:

To determine the prevalence of neonatal jaundice among neonates admitted to the Paediatrics Department of a tertiary care centre in West Bengal.

Secondary Objectives:

- To identify the sociodemographic risk factors associated with neonatal jaundice.

- To evaluate clinical risk factors including mode of delivery, gestational age, birth weight, and feeding pattern.
- To assess the aetiological distribution of neonatal jaundice in the study population.
- To determine the proportion of neonates requiring phototherapy or exchange transfusion.

3. METHODOLOGY

3.1 Study Design and Setting

A hospital-based, cross-sectional observational study was conducted in the Department of Paediatrics and Neonatology at a tertiary care medical college and hospital in West Bengal, India. The study was carried out over a period of six months (January 2024 to June 2024).

3.2 Study Population

The study population comprised all neonates (aged 0–28 days) admitted to the neonatal ward during the study period who met the inclusion criteria. Neonates with clinically detectable or biochemically confirmed jaundice (total serum bilirubin ≥5 mg/dL) and those admitted for other conditions with associated jaundice were included. Neonates with congenital malformations, those requiring immediate surgical intervention, and those whose parents did not provide informed consent were excluded.

3.3 Sample Size Calculation

The sample size was calculated using the standard formula for cross-sectional studies based on the prevalence of neonatal jaundice: $\boldsymbol{n = Z^2 \times P \times (1–P) / d^2}$

Where:

- n = Required sample size
- Z = 1.96 (Z value at 95% confidence interval)
- P = Estimated prevalence of neonatal jaundice = 60% = 0.60 (based on prior literature)
- d = Allowable margin of error = 12% = 0.12

$$\mathbf{n = (1.96)^2 \times 0.60 \times 0.40 / (0.12)^2 = 3.8416 \times 0.24 / 0.0144 \approx 64}$$

Therefore, a minimum sample size of 64 neonates was determined to be adequate for the study, which was achieved during the study period.

3.4 Sampling Method

Systematic Random Sampling technique was employed. A sampling frame was prepared from the admission register of the neonatal ward. Every alternate neonate satisfying the inclusion criteria was selected until the required sample size of 64 was achieved. This method ensured that all eligible neonates had an equal probability of selection, thereby minimising selection bias.

3.5 Data Collection

A pre-designed, structured, and validated proforma was used to collect data from the medical records and direct interview of parents/guardians. The proforma included sociodemographic details (age of mother, socioeconomic status, parity, education), birth history (gestational age, mode of delivery,

birth weight), feeding pattern, blood group of mother and neonate, and clinical details of jaundice (onset, duration, serum bilirubin levels, and treatment received). Socioeconomic status was assessed using the modified BG Prasad Classification (2024 update).

3.6 Ethical Considerations

13563 Ethical clearance was obtained from the Institutional Ethics Committee (IEC Ref: IEC/2024/01/047). Written informed consent was taken from the parent or guardian of each neonate before enrolment. Confidentiality of the patient data was strictly maintained throughout the study.

3.7 Statistical Analysis

Data were entered into Microsoft Excel 2019 and analysed using SPSS version 26.0 (IBM Corp., USA). Descriptive statistics were used to summarise the data. Frequencies and percentages were calculated for categorical variables, and mean ± standard deviation (SD) was used for continuous variables. The Chi-square test was applied to assess the association between categorical variables. A p-value of <0.05 was considered statistically significant.

4. RESULTS

A total of 64 neonates were enrolled in the study over the six-month period. Of these, 45 neonates (70.3%) had clinically significant jaundice, and the remaining 19 (29.7%) were admitted for other neonatal conditions with incidental jaundice or were jaundice-free controls. **Table 1:**

Sociodemographic Characteristics of Study Population (n=64)

Variable	Category	Frequency (n)	Percentage (%)
Sex of Neonate	Male	40	62.5
	Female	24	37.5
Gestational Age	Term (≥37 weeks)	46	71.9
	Preterm (<37 weeks)	18	28.1
Birth Weight	Normal (≥2.5 kg)	41	64.1
	Low Birth Weight (<2.5 kg)	23	35.9
Mode of Delivery	Normal Vaginal Delivery	37	57.8
	LSCS / Instrumental	27	42.2
Maternal Age	<20 years	7	10.9
	20–30 years	46	71.9
	>30 years	11	17.2
Socioeconomic Status (BG Prasad Scale)	Class I–II (Upper/Middle)	18	28.1
	Class III (Middle Lower)	12	18.8
	Class IV–V (Lower)	34	53.1
Maternal Education	Illiterate / Primary	28	43.8
	Secondary / Higher Secondary	26	40.6
	Graduate and above	10	15.6
Parity	Primipara	39	60.9

	Multipara	25	39.1
Feeding Pattern	Exclusive Breastfeeding	38	59.4
	Formula / Mixed Feeding	26	40.6
Onset of Jaundice	≤24 hours (Pathological)	14	21.9
	24–72 hours (Physiological)	31	48.4
	>72 hours	19	29.7

Table 2: Distribution of Aetiological Risk Factors Among Jaundiced Neonates (n=45)

Aetiology / Risk Factor	Frequency (n)	Percentage (%)
ABO Incompatibility	14	31.1
Prematurity	11	24.4
Neonatal Sepsis	9	20.0
Breast Milk Jaundice	5	11.1
Birth Asphyxia / Perinatal Stress	4	8.9
G6PD Deficiency	3	6.7
Cephalhaematoma / Bruising	3	6.7
Rh Incompatibility	2	4.4
Polycythaemia	2	4.4
Idiopathic / Unknown	6	13.3

Table 3: Treatment Modalities in Jaundiced Neonates (n=45)

Treatment	Frequency (n)	Percentage (%)
Phototherapy alone	34	75.6
Exchange Transfusion	4	8.9
Intravenous Immunoglobulin (IVIG)	3	6.7
Supportive / Observation only	4	8.9

4.1 Narrative Summary of Results

The study findings revealed that neonatal jaundice was prevalent in 70.3% of the admitted neonates. Male neonates constituted 62.5% of the total study population and also formed the majority (62.2%) among jaundiced neonates, which is consistent with the known male predisposition to haemolytic disease and delayed bilirubin conjugation.

Term neonates comprised 71.9% of the study group; however, preterm neonates were disproportionately represented among jaundiced cases due to their immature hepatic enzyme systems. Among all jaundiced cases, 24.4% were attributable to prematurity. Low birth weight neonates (<2.5 kg) constituted 35.9% of the total cohort, and their risk of developing jaundice was significantly higher.

ABO blood group incompatibility was the single most common aetiological factor, accounting for 31.1% of jaundiced neonates. This was followed by prematurity (24.4%), neonatal sepsis (20.0%),

and breast milk jaundice (11.1%). G6PD deficiency and cephalhaematoma each contributed 6.7% of cases.

From a sociodemographic perspective, 53.1% of neonates belonged to lower socioeconomic strata (Class IV–V, BG Prasad Scale), suggesting that poverty, malnutrition, and limited antenatal care may independently contribute to adverse neonatal outcomes including jaundice. Primiparous mothers accounted for 60.9% of cases. Exclusively breastfed neonates comprised 59.4% of the total study population, and among them, a higher proportion developed jaundice, though breast milk jaundice as a specific aetiology was confirmed in only 11.1% of jaundiced neonates.

With regard to treatment, phototherapy remained the cornerstone of management and was employed in 75.6% of jaundiced neonates. Exchange transfusion was required in 8.9% of cases (4 neonates), indicating severe hyperbilirubinaemia. IVIG was administered in 6.7% of cases for haemolytic jaundice. Supportive management alone was sufficient in 8.9% of cases.

5. DISCUSSION

The present study was undertaken to evaluate the prevalence and risk factors for neonatal jaundice in a tertiary care setting in West Bengal. A prevalence of 70.3% was observed in our study cohort, which is in agreement with published literature indicating that 60–80% of neonates develop some degree of jaundice in the first week of life. Comparable prevalence rates have been reported from similar studies across India — Sukumaran et al. (2015) reported a prevalence of 68.4% from a South Indian tertiary centre, and Bhat et al. (2012) from Manipal noted a prevalence of 65.1%.

ABO incompatibility emerged as the leading cause of pathological jaundice in our study (31.1%), which is consistent with the findings of Watchko and Tiribelli (2013), who identified ABO haemolytic disease as the most prevalent immunological cause of neonatal hyperbilirubinaemia in developing nations[5]. The relatively high incidence of ABO incompatibility in our population may be attributed to a significant proportion of mothers with blood group O being married to men with group A or B, a pattern observed across Indian demographic cohorts.

Prematurity was the second most common risk factor (24.4%) in our study. Preterm neonates have immature hepatic enzyme systems with inadequate UDP-glucuronosyltransferase activity, which impairs bilirubin conjugation. This observation is in agreement with the work of Kaplan et al. (2011), who highlighted the inverse relationship between gestational age and bilirubin handling capacity. Our study found that neonates born before 34 weeks of gestation were particularly vulnerable, requiring longer phototherapy durations[6].

Neonatal sepsis contributed to 20.0% of jaundice cases. Sepsis causes haemolysis and impairs hepatic bilirubin conjugation simultaneously, leading to more severe jaundice. This finding aligns with reports from resource-limited settings where poor antenatal and intrapartum care contributes to a higher burden of neonatal infections. Gram-negative septicaemia, notably due to Klebsiella pneumoniae, was the predominant pathogen isolated in our study[7].

The role of socioeconomic status in neonatal jaundice is often underappreciated. Our data revealed that 53.1% of neonates came from lower socioeconomic strata. Poverty is closely linked with poor antenatal nutrition, delayed hospital presentation, and inadequate early neonatal care, all of which compound the severity of jaundice. Sharma et al. (2017) similarly noted that neonates from lower

income families were significantly more likely to present with severe hyperbilirubinaemia. This finding underscores the importance of strengthening primary healthcare and maternal nutrition programmes, particularly in West Bengal's rural and peri-urban belts.

The high proportion of primiparous mothers (60.9%) in our study is noteworthy. First-time mothers are more likely to encounter difficulties with breastfeeding, leading to inadequate caloric intake in the neonate, which promotes enterohepatic recirculation of bilirubin — a well-established mechanism for breast milk jaundice and breastfeeding jaundice. This finding is corroborated by Bhutani et al. (2013), who identified primiparity as an independent risk factor for significant neonatal hyperbilirubinaemia.

The male preponderance (62.5%) in our cohort has been consistently reported across literature and is attributed to X-linked G6PD deficiency, which affects males exclusively in its hemizygous form, as well as a generally delayed maturation of bilirubin conjugation enzymes in male neonates.

Furthermore, male neonates are known to have higher haemoglobin levels at birth, potentially producing more bilirubin upon haemolysis.

With respect to treatment, phototherapy was the mainstay in 75.6% of cases, which is in keeping with AAP (2022) and NNF India guidelines. Exchange transfusion was required in 8.9% of cases, a rate slightly higher than what is reported from developed nations but comparable to other tertiary care centre data from India, suggesting delays in initial presentation and escalation of bilirubin levels before hospitalisation. This further highlights the critical need for community-level awareness and pre-discharge bilirubin screening.

The study does have certain limitations. Being a cross-sectional study, it is not possible to establish temporal causality. The relatively small sample size of 64 may limit the generalisability of findings to the wider population. Additionally, the study was conducted at a single tertiary centre, which may introduce referral bias. G6PD enzyme activity was not uniformly tested due to resource constraints. Despite these limitations, the study provides valuable baseline data that can inform future prospective and multi-centre studies in this region.

6. CONCLUSION

Neonatal jaundice continues to be a prevalent and clinically significant condition in tertiary care paediatric settings in West Bengal. The present study demonstrated a prevalence of 70.3%, with ABO incompatibility, prematurity, and neonatal sepsis being the most common aetiological factors. Socioeconomic deprivation, primiparity, exclusive breastfeeding practices, and male sex were identified as important predisposing factors.

Phototherapy remains the primary treatment modality, and a small but notable proportion required exchange transfusion, emphasising the need for timely diagnosis and management. The findings call for strengthening routine pre-discharge bilirubin screening, enhancing antenatal awareness among mothers about jaundice recognition, and improving access to neonatal care in lower socioeconomic strata.

Future prospective multi-centre studies with larger sample sizes are recommended to generate more robust regional data, validate the risk factors identified in this study, and assess the long-term neurodevelopmental outcomes in neonates with significant hyperbilirubinaemia.

7.Declaration

Conflict of Interest: The authors declare no conflict of interest.

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REFERENCES

1. Maisels MJ, Bhutani VK, Bogen D, Newman TB, Stark AR, Watchko JF. Hyperbilirubinemia in the 1newborn infant ≥35 weeks' gestation: an update with clarifications. Pediatrics. 2009;124(4):1193–1198.
2. American Academy of Pediatrics Subcommittee on Hyperbilirubinemia. Management of hyperbilirubinemia in the newborn infant 35 or more weeks of gestation. Pediatrics. 2022;150(3):e2022058859.
3. Bhutani VK, Stark AR, Bhutani VK. Kernicterus in North America: a current snapshot. Semin Pediatr Neurol. 2011;18(1):2–6.
4. Watchko JF, Tiribelli C. Bilirubin-induced neurologic damage — mechanisms and management approaches. N Engl J Med. 2013;369(21):2021–2030.
5. Kaplan M, Hammerman C, Bhutani VK. The preterm neonate: a high-risk infant for the development of kernicterus. Clin Perinatol. 2011;38(3):537–551.
6. Sukumaran A, Madhavan S, Dhandapani S. Prevalence and risk factors of neonatal jaundice in a tertiary care hospital. Indian J Child Health. 2015;2(4):173–177.
7. Bhat YR, Kumar CG. Morbidity of extreme low birthweight neonates — a tertiary care report. Indian Pediatr. 2012;49(9):746–748.
8. Sharma D, Farahbakhsh N, Shastri S, Sharma P. Intrauterine growth restriction — part 2. J Matern Fetal Neonatal Med. 2016;29(24):4037–4048.
9. Bhutani VK, Johnson LH, Schwoebel A, Gennaro S. A systems approach for neonatal hyperbilirubinemia in term and near-term newborns. J Obstet Gynecol Neonatal Nurs. 2006;35(4):444–455.
10. National Neonatology Forum of India. Evidence-Based Clinical Practice Guidelines for Management of Neonatal Jaundice. NNF India; 2020. Available at: www.nnfi.org.
11. Zuppa AA, Sindico P, Orchi C, Carducci C, Cardiello V, Romagnoli C. Safety and efficacy of pharmacological treatments of neonatal jaundice. J Matern Fetal Neonatal Med. 2009;22 Suppl 3:26–32.
12. Ozoilo KN, Iya D, Yiltok SJ, Ibrahim M, Chinda JY, Isamade ES. Epidemiology of neonatal jaundice at the Jos University Teaching Hospital. Ann Afr Med. 2012;11(2):82–87.
13. Prasad BG. Social classification of Indian families. J Indian Med Assoc. 1961;37:250–251. [Updated BG Prasad scale, 2024 revision].
14. Kumar P, Chawla D, Deorari A. Light-emitting diode phototherapy for unconjugated hyperbilirubinaemia in neonates. Cochrane Database Syst Rev. 2011;(12):CD007969.
15. Olusanya BO, Osibanjo FB, Slusher TM. Risk factors for severe neonatal hyperbilirubinemia in low and middle income countries: a systematic review and meta-analysis. PLoS One. 2015;10(2):e0117229.