

Clinicoetiological Analysis of Neonatal Hyperbilirubinemia in a Tertiary Care Hospital

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Abstract: Jaundice is the most common cause of neonatal admission in hospitals. If uncontrolled, severe hyperbilirubinemia can cause permanent neurological impairment called kernicterus. The aim of this study was to analyse the pattern, severity, causes, risk factors, treatment and outcome of neonatal hyperbilirubinemia in our hospital thereby helping identify common preventable risk factors. **Methodology:** This was a prospective study conducted on jaundiced neonates with serum bilirubin > 5mg/dl admitted in PNC and NICU wards over a period of three months. Maternal, antenatal history was taken. Laboratory parameters included serum bilirubin, Hb, blood counts, Blood groups. Treatment modality and outcome was noted during the hospital stay. **Results:** Of the 102 cases, 23% were preterm babies, and 38 % had low birth weight. The commonest cause of neonatal hyperbilirubinemia was physiological jaundice (42%) Pathological jaundice cases had significantly higher bilirubin (17.62 ± 6.11) than physiological jaundice cases (12.5 ± 3.08) with p value < 0.001. Phototherapy was the commonest mode of treatment with good results.

Keywords: bilirubin, etiology, hyperbilirubinemia, neonates

1. Introduction

Neonatal hyperbilirubinemia is one of the commonest causes of admission of neonates in hospitals. Almost 60 % of term babies suffer from jaundice in the first week of their life. Neonatal hyperbilirubinemia is defined as total serum bilirubin level above 5mg/dl.¹ The overall incidence of neonatal jaundice reported by many studies done across India ranges from 54.6% to 77%.²

If left uncontrolled, severe hyperbilirubinemia may later cause permanent neurological impairment called kernicterus. Although a safe threshold for total serum bilirubin has not been defined, most physicians have adopted a bilirubin level more than 20 mg/dl as indicator of vulnerability to neurotoxicity.³

Neonatal jaundice is associated with a wide variety of known physiological and pathological conditions with varying outcomes. The wide variety of risk factors that have been associated with hyperbilirubinemia in newborns include prematurity, previous sibling with jaundice, ABO incompatibility, inadequate breast feeding, infections, birth trauma etc.⁴

Etiological factors leading to hyperbilirubinemia vary among different geographic regions.³ Even the bilirubin concentrations considered harmful or neurotoxic may vary with geographical conditions and ethnic groups.¹ The studies done in parts of northern India have reported sepsis as the leading pathological cause of significant hyperbilirubinemia (>15 mg/dl).² Regions of Maharashtra in western India showed blood group incompatibility to be the major cause of pathological jaundice.⁵ However in a study done in Taiwan the common cause of neonatal jaundice was exclusive breast feeding and G6PD deficiency. They even reported Chinese herb intake and Downs syndrome as etiologic factors.³

With this background, the aim of this study was to analyse the pattern, causes, risk factors, treatment and outcome of neonatal hyperbilirubinemia in our hospital.

2. Materials and Methods

This was a prospective study conducted on jaundiced neonates at PNC and NICU wards of SKNMC and GH over a period of three months (April – June 2015). Total of 102 neonates were studied.

Inclusion Criteria- Jaundiced neonates admitted in PNC and NICU wards identified clinically using Kramers criteria, and their blood samples were sent for bilirubin estimations to confirm hyperbilirubinemia. Neonates were included in study if their bilirubin levels exceeded 5 mg/dl. Parent's consent was taken.

Exclusion Criteria- Jaundiced neonates that came only on OPD basis, or didn't get admitted in the wards, or got discharged against medical advice, whose parents refused to consent.

Each baby delivered at hospital was carefully observed from birth onwards in day light, for appearance of jaundice. Cases were evaluated along with the maternal and antenatal history. Laboratory parameters included serum bilirubin (total, direct, indirect), Hb, TLC, DC, Cell morphology. Bilirubin estimation was done using Diazo method. Blood groups of mother and baby were assessed. Weight of babies and their feeding patterns was assessed and monitored. Thorough clinical examination of babies was done. Follow up of neonates was done until discharge. Treatment included phototherapy and exchange transfusion depending on the severity and cause of the jaundice. Treatment modality and outcome was noted during the hospital stay.

3. Results

A total of 102 cases were studied. Male babies were affected more often (54 %) than female (46%). The mean age of neonates was 3.93 ± 2.5 days. The mean age of mothers was 24.1 ± 4 years; with the youngest being 19 and the oldest 37 years. The mean gestation age was calculated to be 37.24 ± 2

weeks. 58% were born via normal labour, 42% by caesarean section. Almost 23% were preterm.

Table 1: Distribution according to gestational age at birth

| | Number | Percentage |
|----------------|--------|------------|
| Preterm babies | 23 | 22.5% |
| Term babies | 75 | 73.5% |
| Post term | 4 | 4% |

Table 2 shows distribution of jaundiced babies depending on birth weight

Table 2: Distribution of babies based on birth weight

| Birth weight | Number | Percentage |
|---------------------|--------|------------|
| Normal | 61 | 60% |
| LBW (1500-2500 mg) | 39 | 38% |
| VLBW (1000-1500 mg) | 2 | 2% |

Majority of the cases had their total bilirubin levels below 15mg/dl mainly comprising the physiological jaundice cases as shown in fig (1).

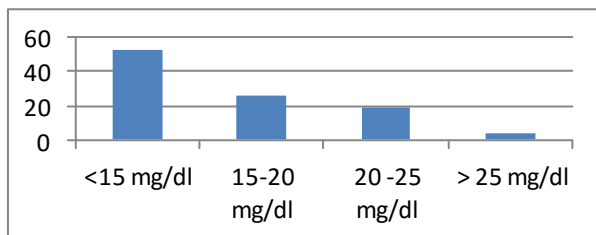


Figure 1: Number of neonates with different bilirubin levels

As is evident in figure (2) and table (3), physiological jaundice was commonest in babies and the most common cause of pathological hyperbilirubinemia was ABO Incompatibility (27 %) followed by Rh incompatibility (12 %).

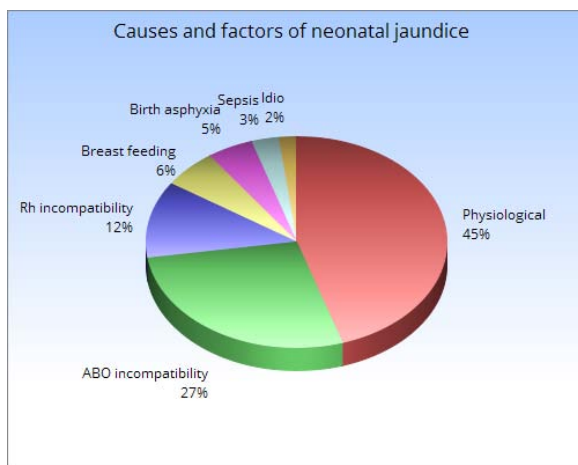


Figure 2: Causes and aggravating factors of neonatal jaundice

Table 3. Causes and aggravating factors of hyperbilirubinemia

| Cause or aggravating factor | Number of cases | Percentage |
|-----------------------------|-----------------|------------|
| Physiological | 46 | 45.09 % |
| ABO incompatibility | 28 | 27.45% |
| Rh incompatibility | 12 | 11.76% |
| Breast feeding | 6 | 5.88 % |
| Birth asphyxia | 5 | 4.9% |
| Sepsis | 3 | 2.94% |
| Idiopathic | 2 | 1.96% |

Mean bilirubin values for pathological cases (17.62 ± 6.11 mg/dl) was significantly higher than physiological jaundice (12.53 ± 3.08 mg/dl) with a 'p' value <0.001.

Bilirubin levels were higher in case of ABO incompatibility (19.4 ± 2.1 mg/dl) than Rh incompatibility (11 ± 0.9 mg/dl). Among the jaundiced babies, 22 had bilirubin levels above 20 mg/dl of which majority were due to ABO incompatibility (9). Six cases were attributed to breast feeding jaundice. Low Hb levels (< 10 mg/dl) were observed in five cases of which four had Rh incompatibility.

The mean age of presentation with jaundice was three days. ABO and Rh incompatibility cases presented earlier on (within 3- 4 days) with jaundice than breast feeding jaundice cases (6-7 days).

Table 4: Treatment modality used

| | n=102 | PERCENTAGE % |
|-----------------------|-------|--------------|
| PHOTOTHERAPY | 93 | 91.17 |
| EXCHANGE TRANSFUSION | 2 | 1.96 |
| NO TREATMENT REQUIRED | 7 | 6.86 |

All the babies showed significant improvement with phototherapy and exchange transfusion. Some physiologically jaundiced babies improved without any active treatment and were advised daily sun exposure until improvement. Exchange transfusion was given only in severe cases of jaundice due to ABO incompatibility.

4. Discussion

Our study is the first of its kind in our hospital setup. Many studies in the past show a male preponderance in neonatal jaundice cases similar to our study.^{2, 6, 7} Prematurity is a prominent risk factor for neonatal hyperbilirubinemia. Studies done by Choudhary et al and Shah et al, found 37 % and 30 % cases respectively to be preterm babies like our study (23%).^{7, 8} Preterm babies are at risk of developing jaundice due to the immature liver. Generally babies with bilirubin levels above 20 mg/dl are considered to be at higher risk of developing kernicterus, however several studies have shown kernicterus to appear at much lower levels of 10 -18 mg/dl in premature infants.⁹

Birth weight also plays a significant role, as observed in our study where 38 % of the jaundiced babies had low birth

weight, in accordance with findings by Narang (34.5 %), Shah (27 %) and Choudhary et al (42%).^{9, 8, 10}

Several studies have reported physiological jaundice to be the most common cause of neonatal jaundice like our study.^{2, 6, 7} In the fetal stage bilirubin is excreted by the placenta, and after birth in the neonatal stage, the bilirubin has to be excreted from hepatic cells into the biliary system, so the transition from the fetal stage to the neonatal stage becomes crucial reason for physiological jaundice

Similar to our findings, Rama et al, Shah et al, Joshi et al, reported ABO incompatibility as the most common cause of pathological jaundice.^{6, 8, 11} Sepsis was found to be commonest cause of pathological jaundice in studies by Bahl et al (10.5%) and choudhary et al (17.6 %) in Shimla and Bangladesh respectively.^{2, 7} Another study in Chandigarh found G6PD deficiency (17%) to be the leading cause of pathological jaundice followed by sepsis (9 %).¹⁰

In our study blood incompatibility was the most common cause of pathological jaundice. Like our findings Hao weng et al found Rh incompatibility to be less common but causing more severe hyperbilirubinemia and haemolytic jaundice than ABO incompatibility.¹² Choudhary et al found ABO incompatibility (11.5%) to cause almost twice the number of pathological jaundice as Rh incompatibility (5.4 %) much like our findings.⁷

Birth asphyxia is a serious aggravating factor in jaundice cases. 7.5% and 10.8 % babies had birth asphyxia in studies done by Kulkarni et al and Rama et al.^{5, 6} In our hospital too, 4.9 % babies had asphyxia that worsened the jaundice in the infants.

Few have reported sepsis as the more common cause of pathological jaundice.^{2, 7} In our study three babies had sepsis comprising 2.94 % of cases. Our findings are in concordance with findings of Narang et al and Singhal et al.^{10, 13} A study in Maharashtra reported 8.3 % of cases with sepsis.⁵ Sepsis leads to RBC hemolysis in circulation and even hepatic infection, thereby causing hyperbilirubinemia. With better facilities available in urban tertiary care hospitals and aseptic precautions taken during delivery, the sepsis cases should decline in future.

Majority of the babies were on exclusive breast feeding (91%). Almost 6 % developed breast feeding jaundice due to inadequate milk production or infrequent feeds. Shao wen et al reported breastfeeding as the commonest etiological factor for jaundice.³ This may be attributed to the late or insufficient milk production by the mother or because of poor feeding techniques. Reduced feeding leads to dehydration causing lesser bowel movements in the newborn, which results in decreased bilirubin excretion from the body.¹⁴

Often multiple etiological factors occur together, and these combined etiologies may result in greater severity of neonatal hyperbilirubinemia thereby putting the baby at higher risk of developing neurological complications.³

The cause of two cases could not be identified. Various studies from across our country have shown Idiopathic neonatal jaundice cases to range from 8.8 – 57 %.¹⁰

A high neonatal readmission rate, within days of discharge from hospital has been noted in Canada, mainly due to severe hyperbilirubinemia.¹⁵ Infants jaundiced in the first few days are more likely to develop hyperbilirubinemia later.⁹ Early detection and management of neonatal jaundice is thus very important. The anxiety caused by such hospital admissions can be prevented if the risk factors can be identified before discharge.¹⁵ Before neonates are discharged those at risk of developing high bilirubin levels need to be identified. The risk assessment is better when the clinical risk factors are assessed along with serum bilirubin levels.¹⁶

All the babies showed good results after phototherapy. A majority of jaundiced neonates recover with phototherapy, very few who don't, need to undergo exchange transfusion that removes partially hemolysed and antibody coated blood cells.¹ Recently even Intravenous immunoglobins have been used as additional treatment modality in cases of blood group incompatibility to reduce the bilirubin levels.¹² With such efficient treatment modalities available, all that is needed is to identify such babies at risk.

5. Conclusion

Physiological Jaundice was found to be the commonest cause of jaundice. ABO and Rh incompatibility were mainly responsible for pathological jaundice.

Phototherapy was found to be a safe, cheap and effective way to reduce bilirubin levels in neonatal jaundice.

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