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## Assessment of factors leading to neonatal hyperbilirubinemia: A hospital based study

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### Abstract

Jaundice is most frequent problem faced by neonates in the first few week of their life. The aim of the study is to find out the aetiology of hyperbilirubinemia in neonates admitted in neonatal intensive care unit in our hospital. In this observational study 187 newborns were registered prospectively over 1 year of study period from November 2014 to January 2016. In this study all the newborns less than 28 days of age were included who had clinical jaundice and confirmed by bilirubin estimation by blood. The investigations done were Blood grouping & Rh typing of baby & mother, Serum bilirubin (total, direct bilirubin), complete blood count, reticulocyte count, comment on peripheral smear, G6-PD estimation, direct Coombs' test, TSH. The results revealed that out of 2120 babies delivered in this period, 686 (32.35%) babies have clinical jaundice, but Hyperbilirubinemia needing transfer to neonatal intensive care unit for phototherapy was in 381 (17.97%) cases. The commonest causes of pathological jaundice were found to be Prematurity, Excessive weight Loss, ABO setting. Direct Hyperbilirubinemia was observed in 8 babies, among which 3 were from biliary atresia and 3 from ABO incompatibility, 1 from Rh incompatibility. Most of the babies had onset of jaundice between days 3-7 of life. Exchange transfusion was conducted in 6 cases, 3 from G6PD deficiency, 2 from Rh incompatibility.

**Keywords:** Neonatal jaundice, hyperbilirubinemia, neonates, NICU

### Introduction

Neonatal jaundice is a common problem in neonates with a rate of about 60% in term babies and 80% in preterm babies. It is the commonest reason for admission to the neonatal ICU [1]. Jaundice refers to the yellowish discolouration of the skin and sclera of infants that outcome from aggregation of bilirubin in the skin and bodily fluid layers. Clinically it becomes detectable when the serum bilirubin surpasses 7 mg/dl in neonates [2]. In the majority of the cases, it is physiological and no intervention is needed. Around 5-10% of them have severe hyperbilirubinemia requiring phototherapy [3, 4]. The rate of jaundice is higher in preterm babies, because of their physiological immaturity of liver, high blood volume and other complications like sepsis. Timely detection of jaundice and optimal management are crucial to prevent bilirubin induced brain damage and subsequent neurodevelopmental impairment such as hearing loss, athetosis and rarely intellectual deficits [5]. Dermal staining with bilirubin (cephalo-caudal progression), first reported by Kramer [6]. in 1969 has been widely used clinically to visually assess the severity of neonatal jaundice. In any case, Moyer *et al* [7]. in 2000 have revealed marked discrepancies between visual evaluation by health specialist and actual serum bilirubin levels. As of late, there is increase reporting of cases of kernicterus [8]. Kernicterus is because of staining of basal ganglia in brain with bilirubin, leading to the severe adverse neurologic outcomes [9]. Every newborn is at potential hazard if jaundice is not monitored or overseen improperly. This examination is being directed to find out the different aetiologies of neonatal jaundice in our hospital.

### Material and methods

In present study, patients were enrolled prospectively over fifteen month study period from Nov 2014 to Jan 2016. Detailed patient information was taken at the time of admission in NICU. Study was done in Neonatology unit of IMS and Sum hospital Bhubaneswar, after getting informed consent from parents. Study was approved by Institutional Ethics Committee. In this study all the new-borns with age less than 28 days were included who had clinical jaundice, ascertained by Kramer's criteria and confirmed by biochemical methods.

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Pre-defined proforma was filled to record antenatal, natal, postnatal history and thorough clinical examination, with special emphasis on any cephalhematoma/ subgaleal hemorrhage/ external hematoma/ contusion/ hepatosplenomegaly, investigations in each baby with Hyperbilirubinemia. Each baby delivered at hospital were carefully observed from birth onwards in day light, for appearance of jaundice and in the babies with dark complexion, digital pressure over forehead has been used to detect jaundice. The investigations done were Blood grouping & Rh typing of baby & mother, Serum bilirubin (total, direct bilirubin), complete blood count, reticulocyte count, comment on peripheral smear, G6-PD estimation, direct Coombs' test, TSH. All the data were entered in excel sheet. Percentage was computed for categorical variables. Comparison was done by student t- test.

**Result**

During the study period 2120 babies were delivered in the hospital. Out of this 686 (32.35%) babies were found to have jaundice by clinical examination. Only 381 (17.97%) babies of this 2120 babies needed treatment with phototherapy. Maximum number of babies (56.4%) were in late Preterm category followed by term babies (27.29%). As per the weight category 122 babies were in between 2.5-4kg categories (43.04%), followed by babies between 1.5-2.5kg categories. (Table 1) Severe Hyperbilirubinemia (serum total bilirubin >20mg%) were seen in 41 babies (10.75%). Most

babies (76.64%) had bilirubin in the range of 15-20mg%. (Table 2)

**Table 1:** Distribution of babies admitted for phototherapy as per gestational age and weight

Gestational age	Number (n=381)	Weight	Number (n=381)
< 28wk (extreme Preterm)	4(1.04%)	<1kg	5(1.31%)
28-34wk	53(13.91%)	1-1.5kg	72(18.89%)
34-37wk (Late preterm)	215(56.4%)	1.5-2.5kg	122(32.02%)
37-42wk (Term)	104(27.29%)	2.5-4kg	164(43.04%)
>42wk(Post Term)	5 (1.31%)	>4kg	18(4.72%)

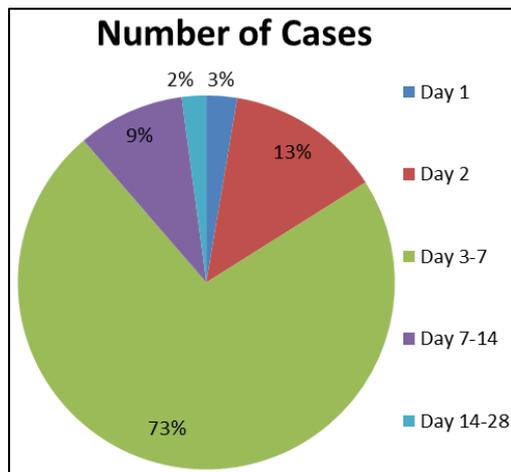
**Table 2:** Distribution of bilirubin level

Bilirubin Level	No. of cases
10-15mg%	48(12.59%)
15-20mg%	292(76.64%)
20-25mg%	31(8.13%)
>25mg%	10(2.62%)

The risk factors associated with neonatal jaundice was studied. Prematurity was found to be the most important cause (46.45%) of neonatal hyperbilirubinemia in our study followed by excessive weight loss at admission (11.81%), Cephalhematoma/Subgaleal hemorrhage (9.18%). (Table 3) G6PD deficiency was found in 15 babies (3.93%).

**Table 3:** Etiology of neonatal jaundice

Excessive weight loss	45(11.81%)	Cephalhematoma/ subgaleal hemorrhage	35 (9.18%)
Infant of Gestational diabetes Mother	30 (7.87%)	G6PD deficiency	15 (3.93%)
Prematurity	177 (46.45%)	Hypothyroid	5 (1.31%)
ABO Incompatibility	15 (3.93%)	Breast Milk Jaundice	3 (0.78%)
Rh Incompatibility	5(1.31%)	Biliary atresia	3(0.78%)
Sepsis	20 (5.24%)	Unknown	28 (7.34%)



**Fig 1:** Day of onset of jaundice

Jaundice needing phototherapy was mostly seen between day 3-7 of life (72.7%). Day 1 jaundice noted in 10 babies (2.62%) and 35 (9.18%) babies has jaundice beyond day 14 of life. (Figure 1)

No significant difference was found between the male (55.64%, n=212) and female (44.35% n=169) group with respect to distribution of bilirubin levels. The commonest cause of pathological jaundice was found to be prematurity in 46.45% cases. In our study 3 babies developed features of

bilirubin induced neurologic dysfunction. Exchange transfusion was done in 6 cases, the cause of jaundice in the cases that require exchange transfusion include 3 from G6PD deficiency, 2 from Rh incompatibility, 1 baby with ABO incompatibility.

**Discussion**

In our present study, neonatal hyperbilirubinemia is a typical issue in neonates with a rate of about 27% in term babies and 71% in preterm babies. It is the commonest reason for admission to the emergency clinics in the neonatal period [1]. According to gestational age 272 (71%) were preterm and 104 (27.29%) were full term babies which was similar to different studies [5-7]. 32.02% were low birth weight babies (<2.5 kg). Majority of the infants 292 (76.64%) were found to have bilirubin levels of 10-15mg%, followed by 48 children (12.59%), which were having total bilirubin levels of 15-20mg% which was tantamount to consider by Jamir *et al* [12]. In the present study 305 (44.46%) babies were having physiological jaundice whereas (55.53%) were found to have pathological jaundice. Jamir *et al* did a similar study but result was contradictory [10]. Similar incidence were also reported by Bahl *et al*. [13]. Other studies reported incidence of physiological jaundice respectively as Singhal *et al* (16.7%) and Merchant *et al* (25.3%), which were lower than the present study [14]. In the study by Bedowra *et al* physiological jaundice contributes to 53.3% as the most

common cause in their study. It was marginally higher as compared to our study<sup>[15]</sup>.

Most common etiological factor for pathological neonatal hyperbilirubinemia was found to be Prematurity (56.64%) followed by excessive weight loss (11.81%). This result were not similar with Jamir *et al*, who reported that the most common etiological factor for pathological neonatal hyperbilirubinemia was due to deficiency of enzyme G6PD (12%) followed by prematurity (8.7%) and sepsis (5.3%)<sup>[11]</sup>. we found G6PD deficiency as cause of jaundice in 4% of our babies. In another study by Ali *et al* reported that the etiological factors in the causation of jaundice in the decreasing order of frequency were physiological (28%), ABO incompatibility (24.4%), Rh incompatibility(13.6%), much higher rate of ABO incompatibility (28%-51%) was reported by other authors<sup>[16-18]</sup>.

We found that the majority of the infants had beginning of jaundice between day 3-7 of life (72.7%) trailed by (13.38%) babies in which beginning was on day 2 of life. In study of Ali *et al* revealed that the beginning of jaundice was seen most extreme between 24-72 hours (58%), followed by age day 3-14 of life (32%).

### Conclusion

Jaundice is a common issue in neonatal period, which needs timely monitoring for detection and initiation of treatment (phototherapy). Delay in detection and treatment can lead to increase in total bilirubin value, that may cause bilirubin induced neurologic dysfunction and long term neurodevelopmental delay. Advice to Parents is required for bringing their infants right on time to for early detection and treatment to avoid such complications. Prematurity, excessive weight loss, infant of gestational diabetic mothers are common causes of neonatal hyperbilirubinemia in our study.

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