
RISK FACTORS AND OUTCOME OF NEONATAL JAUNDICE IN A TERTIARY HOSPITAL

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Abstract

Neonatal jaundice is a common cause of newborn hospital admission. The risk factors, the characteristics and outcomes related to neonatal jaundice in Bangladesh has not been studied so far. This study addressed the outcomes, characteristics and risks of the jaundiced newborn admitted into hospital. The babies who had significant jaundice and required phototherapy and /or exchange transfusion were investigated. A detailed history of delivery with gestational age was noted and clinical examination of the admitted newborn was done. Birth weight was recorded. The investigations included complete blood count, ABO and Rh compatibility, serum bilirubin, glucose 6 phosphate dehydrogenase (G6PD), thyroid stimulating hormone (TSH) and ultrasonography (USG) of brain. The newborns were closely monitored for the prognosis. The requirement of individualized phototherapy and exchange transfusion were also noted. Finally, the outcomes were recorded. Overall, 60 (m v. f = 58.3 v. 41.7%) newborns were found who developed significant jaundice and were investigated. Of them, 35% had gestational age less than 32wks and only 32% had equal to or greater than 35wks. Regarding delivery, 83.3 % had the history of caesarean section. ABO- and Rh- incompatibilities were found in 13.3% and 3.3%, respectively. Septicemia was diagnosed among 26.7% though blood culture yielded growth only in 20%. Compared with the higher gestational age-group (≥ 35 wks) the lower group (< 32 wks) showed significantly higher rate of septicemia (12.5 v. 68.8%, $p < 0.005$). G6PD deficiency was found in only one (1.7%) case. Birth asphyxia was found as a concomitant factor in three patients. Exchange transfusion was done only in 2 (3.3%) babies. Among them one was preterm IDM with septicemia and other had G6PD deficiency. None of these babies developed kernicterus. Five (8.3%) babies died, all of them had septicemia and one baby also had intraventricular hemorrhage (IVH) with PDA. The study revealed that a substantial number of neonatal jaundice had the history of lower gestational age in Bangladeshi newborns; and the lower gestational age is significantly associated with septicemia and possibly with hyperbilirubinemia. More study is needed to establish the study findings.

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Introduction

Neonatal jaundice is estimated to occur in 60% of term newborns in the first week of life,¹ and $< 2\%$ reach total serum bilirubin (TSB) levels of 20 mg/dL.² In rare instances, the TSB reaches levels that can cause kernicterus, a condition characterized by bilirubin staining of neurons and neuronal necrosis involving primarily the basal ganglia of the brain and manifested in athetoid cerebral palsy, hearing loss,

dental dysplasia, and paralysis of upward gaze.³ Risk factors recognized to be associated with severe hyperbilirubinemia in newborns have jaundice in the first 24 hours of life. Glucose-6-phosphate dehydrogenase (G6PD) deficiency, ABO incompatibility, low birth weight and sepsis are the common causes of neonatal jaundice in Asian and South-east Asian regions, but there is a group of babies whose cause of neonatal

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jaundice has yet to be found. Genetic factors and unidentified environmental factors may also play a role in the prevalence of neonatal jaundice.⁴ Glucose 6-phosphate dehydrogenase (G6PD) deficiency is the most important disease of hexose monophosphate pathway. G6PD is an x-linked recessive disease, where the deficiency of the enzyme causes a spectrum of clinical manifestations ranging from neonatal jaundice to chronic nonspherocytic anemia, and drug-induced hemolysis.⁵ Neonatal jaundice is a fairly common cause of morbidity in Bangladesh. However; little information is available on patterns of neonatal jaundice. Special Care Baby Unit (SCABU) in BIRDEM is a neonatal intensive care unit (ICU), which has been running for last 13 years where seriously ill babies are referred to. In one study in SCABU it was observed that incidence of neonatal jaundice was 23.5%; and among them about 17% required exchange transfusion.⁶ Identifying infants at risk of developing severe hyperbilirubinemia and early intervention have reduced levels of morbidity and mortality associated with bilirubin encephalopathy. This study was designed mainly to find out the characteristics of the jaundiced newborns and their outcomes; and to detect the risk factors related to the newborn hyperbilirubinemia, which is prevalent in Bangladesh.

Materials and Methods

This study investigated the jaundiced newborns admitted in SCABU, BIRDEM from November 2007 to May 2008. All newborns who developed hyperbilirubinemia and required phototherapy and/or exchange transfusion within the first seven days of life were included in this study. Physiological jaundice and jaundice not requiring phototherapy were excluded from this analysis. All babies were managed according to a standardized management protocol. Complete blood count, serum bilirubin, blood group and TSH were done in all babies. Serum bilirubin was done by Jendrassik method. Blood Culture was done in those newborns who were having clinically suspected septicemia. Coombs test and reticulocyte count were done in babies of O+ve or Rh-ve blood group mothers. USG of brain was done in babies who were preterm LBW having suspected IVH. TORCH screening was done who were having clinically suspected congenital infection. G6PD deficiency was screened in red cells by a quantitative method (by Autoanalyzer Hitachi

912, Pentra-400 & NOVAemiaCRas septicTId ly suspecte4) in those babies who had rapid rise of serum bilirubin.

Case records of all newborn infants were evaluated for details of the maternal antenatal history, labor, and mode of delivery. Septicemia was defined clinical suspicion with positive blood cultures and/or features (reluctance on feeding or poor feeding, abdominal distension, less activity, respiratory distress, apnea, hypo or hyperthermia etc.) of infection necessitating antibiotics for ≥ 7 days, in the absence of other attributable causes. Newborn infants < 37 wks gestational age with significant hyperbilirubinemia who could not be categorized into any other major etiological category were considered to have 'prematurity' associated jaundice. Jaundiced newborns who could not be categorized into any of the aforementioned criteria were placed in an "Unknown" category. Data was analyzed using SPSS (Statistical Package for Social Sciences) version 12. Appropriate statistical test of significance like t-test or chi-sq test were used as necessary. P value < 0.05 was taken as level of significance.

Results

A total of 60 newborn infants (m / f = 35 / 25) were investigated. The characteristics of the infants are shown in (table -1). The mean gestational age and birth weight were 33.8 ± 2.8 wks and 1.94 ± 0.68 kg, respectively.

The mean Hb (SD) level was 16.3 (2.3) gm/dl, total serum bilirubin was 15.4 (2.3) gm/dl, G6PD level was 224 (83) U/dl, WBC count was 13550 (99636) / cmm and TSH level was 3.6 (2.5) μ IU/L. No hypothyroidism was found.

The peak TSB level varied from 8.6 to 26.5 mg/dl with maximum TSB > 20 mg/dl in 7 (11.6%) cases. Prematurity, IDM, septicemia and ABO incompatibility were observed in 44 (73.3%), 21 (35%), 16 (26.6%) and 8 (13.3%) cases respectively. G6PD deficiency was found in only one (1.7%) case. Two babies had intraventricular hemorrhage. Birth asphyxia was found as a concomitant factor in three patients. Regarding risk assessment ABO incompatibility was significantly higher in the term ($p < 0.02$) and IDM was significantly higher in preterm ($p < 0.05$) group compared with their counterparts (table 2). More significant differences of

Table 1: Characteristics of the investigated newborns (n = 60)

Variables	Values	
	n	%
<i>Qualitative</i>		
Sex (m / f)	35 / 25	58.3 / 41.6
ABO Incompatibility	08	13.3
Rh incompatibility	02	3.3
G6PD deficiency	01	1.7
Prematurity	44	73.3
Infants of diabetic mother	21	35
Sepsis	16	26.7
†Growth on blood culture	14	68.3
Unknown	01	1.7
<i>Quantitative</i>	<i>Mean</i>	<i>SD</i>
Gestational age (weeks)	33.8	2.8
Birth weight (gm)	1.94	0.68
Hb (gm/dl)	16.3	2.3
WBC (/L)	13.55x10 ⁹	7.37x10 ⁹
Platelet count (/L)	17.34x10 ¹⁰	17.34x10 ¹⁰
Total Bilirubin (mg/dl)	15.4	3.6
TSH (μIU/L)	3.6	2.5
‡G6PD level (U/dl)	224	83

SD – standard deviation

† - common organisms were *klebsiella* (6) & *nonalbicans candidia* (6)

‡ (Glucose 6 Phosphate Dehydrogenase was done in 24 babies)

risk factors were observed when comparison was made between the first and third tertile of gestational age (< 32 v. ≥ 35wks) (table 2).

Exchange transfusion was done only in 2 (3.3%) babies. Among them one was preterm IDM with Septicemia and other had G6PD deficiency. None of these babies developed kernicterus. Five babies died who developed septicemia and one of them also had IVH with PDA.

Table 2: Comparison of risk factors of the newborn babies between Term v. Preterm (< 35 v. ≥ 35wks) and also between first tertile (< 32wks) and third tertile (≥ 35wks) of gestational age

Risk factors	Term		p	Gestational age		p
	<37wks	≥37		<32wks	≥35wks	
ABO incompatibility	N (%) 5 (8.3%)	N (%) 3 (5%)	.014	N (%) 5 (8.3%)	N (%) 3 (5%)	.009
Rh incompatibility	1 (1.7%)	1 (1.7%)	ns	1 (1.7%)	1 (1.7%)	ns
IDM	9 (15%)	12 (20%)	.037	9 (15%)	12 (20%)	ns
Sepsis	2 (3.3%)	14 (23.3%)	ns	2 (3.3%)	14 (23.3%)	.01

ns - not significant

Discussion

In our study population male (58.3%) were predominant with ratio of male to female 1.4:1. This result coincided with that of 64.2 percent from a study conducted in India.⁷ Total serum bilirubin (TSB) ≥ 20 mg/dl occurred in 7 (11.6%) cases. This high level of TSB level was reported only in 1.5% and 1.3% of live births by other studies.^{7,8} This difference of prevalence might be due either to difference in procedure or to severity of the cases recruited in this study who required intervention. Prematurity (73.3%) was the most common cause of neonatal hyperbilirubinemia whereas ABO incompatibility and prematurity were reported as commonest causes of hyperbilirubinemia by Dawodu *et al.* from United Arab Emirates (UAE) and by Guaran *et al.* from Australia.^{9,10} Sepsis was incriminated in 26.6% cases whereas one of the similar study reported sepsis in 36.4% cases of neonatal hyperbilirubinemia.¹¹ ABO incompatibility and Rh incompatibility were found in 13.3% and 3.3% respectively. A similar type was found in a study where 12% had ABO incompatibility and 5.3% had Rh incompatibility.¹² Thirty five percent neonates were IDM in this study which is quite different than other studies where only 3.3% were IDMs.¹³ This might be that we have a good number of diabetic mothers who deliver their babies at BIRDEM.

G6PD level was estimated in 30 newborns whose bilirubin was rapidly rising and we found G6PD deficiency only in 1 case. Actual incidence of G6PD deficiency in Bangladesh is very few. Akhter N, *et al.* found that 7.7% had G6PD deficiency among infants with neonatal jaundice.¹⁴ In contrast, the prevalence was as high as 62% in Kurdish Jews¹⁵ and 31% in northern Vietnam.¹⁶ In this study baby who was detected G6PD deficiency had rapidly rising bilirubin level and required exchange transfusion.

In this study, 1.7 percent had no obvious cause and may be considered as idiopathic. Various reports from India revealed that Idiopathic Neonatal jaundice ranged between 8.8 to 57.6 percent.^{17,18,19} Our findings is inconsistent to the Indian reports – may be due to different genetic and / or environmental factors. Birth Asphyxia was found to be concomitant factor in 5% babies which was very close to that of 7% mentioned in one study.²⁰

In our series none of the babies had any abnormal neurological symptoms or signs. Though one study in Canada 19.8% infants had abnormal neurological

symptoms.²¹ This may be the reason that we could not follow up the babies for prolonged time. Only two (3.3%) patients required exchange transfusion which is comparable with a study in Pakistan (3%).¹³

Conclusion

In our study prematurity, IDM and septicemia were found to be most frequent causes of neonatal jaundice. Hemolytic causes like rhesus, ABO incompatibility and glucose-6-phosphate dehydrogenase (G6PD) deficiency were found insignificant. The babies who died developed septicemia. This was a hospital based study conducted on small sample size. A well designed population based study is needed to confirm the risk factors related to newborn jaundice, which in turn help prevention of neonatal mortality and morbidity in Bangladesh.

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