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Original Article

Causes, Management and Immediate Complications of Management of Neonatal Jaundice – A Hospital-Based Study

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Abstract

***Background**: Jaundice is very common in the neonatal period of life. Although it is not a major cause of mortality, it is an important cause of morbidity. So, assessment of the causes and risk factors of neonatal jaundice is very important. **Objectives**: The objectives of the study were to find out the causes of jaundice, its clinical features, evaluation of the outcome of current management strategy and complications encountered by the participating subjects following treatment. **Materials and Methods**: This prospective study was conducted in the Neonatal Unit of Rangpur Medical College Hospital (RpMCH) during July to December 2006. A total of 100 neonates having jaundice on admission or who developed jaundice following admission were included in the study. A number of investigations were done for the purpose of assessment of neonates and their icteric condition. The test statistics used to analyse the data were descriptive statistics, Chi-square (c^2) and correlation tests. **Results**: In the present study the median age of the jaundiced newborns on admission was 5 days, while the median age of appearance of jaundice was 3.5 days. Most of the newborns exhibited jaundice 24 hours after birth and peaked by 3–4 days. Majority of the subjects (77%) had pathological jaundice and only 23% had physiological jaundice. This study shows septicemia was in 28% cases followed by asphyxia (20%), prematurity (18%), Rh incompatibility (15%), IUGR (11%) etc. Half of the newborns (51%) had serum bilirubin (indirect) ⩾10 mg/dL. Gestational age and serum bilirubin was found to exhibit a negative correlation. Preterm babies also tend to develop severe to very severe jaundice more than their term counterparts ($p<0.001$). Birth weight was also found to bear a negative correlation with serum bilirubin. Low birth weight (LBW) babies also had a significantly higher tendency to develop severe to very severe jaundice ($p<0.001$). Of the 77 patients who were treated, about 64% received phototherapy, 61% received antibiotics and very few (5.2%) received exchange transfusion. Majority of the patients developed some sorts of complications. The predominant complications of phototherapy were irritability (40.8%) followed by skin rashes (26.5%), loose motion (20.4%) and dehydration (16.3%). Very few newborns (4%) had hyperthermia. All four babies who received exchange transfusion suffered from hypovolaemia, one developed hypoglycaemia and one exhibited anaemia. **Conclusion**: Neonatal jaundice is a leading cause of hospitalisation in the first few weeks of life throughout the world. Though management of unconjugated hyperbilirubinaemia in newborns has undergone changes based on emerging evidences, phototherapy and exchange blood transfusion are still the most commonly used effective modalities for lowering serum bilirubin level.*

***Key words**: Neonatal jaundice; Exchange transfusion; Hyperbilirubinaemia*

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Introduction

Neonatal jaundice is a common phenomenon affecting 60% of full term and 80% of preterm babies in first 3 days of life.[1] Over two-thirds of newborn babies develop clinical jaundice and by adult standard almost all newborn babies are 'jaundiced' during early days of life. Yellow discoloration is first evident on the skin of the face, nasolabial folds and tip of the nose.[2] Neonatal jaundice may not be a major cause of mortality but it is an important cause of morbidity in the neonatal period and beyond.[3] Because of the crippling complications like kernicterus and other abnormal psychomotor and neurological sequelae due to hyperbilirubinaemia, early recognition and adequate management to prevent these complications are important. The prematurity is the major factor in determining the susceptibility to bilirubin encephalopathy.[4] Assessment of the causes and risk factors is of paramount importance for adequate management.

The aetiology and risk factors of neonatal jaundice in developing countries may differ from those of the developed countries due to racial, cultural and environmental differences and some other contributory factors. But very few studies have been conducted in this regard in our country till date. To assess neonatal jaundice covering all its ramifications is therefore imperative to help our clinicians, particularly paediatricians, in developing better management strategy for neonatal jaundice.

Lucy et al[5] established the efficacy of phototherapy in neonatal hyperbilirubinaemia and now it is widely used throughout the world. However, there are some cases which need exchange transfusion. With the advent of newer concepts and technologies after it was first employed by Diamond[6] in 1948, the outcome of neonatal jaundice has been changed all over the world. With the declining incidence of Rhesus disease, ABO incompatibility is said to be the commonest cause of haemolytic jaundice in the newborn, the outcome of which is comparatively good.[7]

The present study was conducted to find the causes and to evaluate the existing management strategy practiced by the paediatricians in the tertiary level hospitals of our country including complications following management.

Materials and Methods

This prospective study was conducted in Neonatal Unit of Rangpur Medical College Hospital (RpMCH) between July to December 2006. All patients who were admitted in neonatal unit of Rangpur Medical College Hospital (RpMCH) during the above mentioned period with jaundice and who developed jaundice following admission were the population of this study.

Grading of neonatal jaundice [8,9]

Grading	Dermal yellow staining	Serum bilirubin (mg/dL)
Mild	Face	<5
Moderate	Chest and abdomen	5–10
Severe	Lower limbs up to ankle joint Upper limbs up to wrist joint	11–15
Very severe	Palms and soles	>15

Procedural details

On admission into the neonatal unit, salient demographic characteristics, birth history suspected to be associated with neonatal jaundice and the day of appearance of jaundice were noted. A number of investigations were done to assess the causes of jaundice, to aid in diagnosis and evaluate prognosis of treatment. The investigations invariably done in all cases were serum bilirubin (direct/indirect), CBC, PBF, blood grouping and Rh typing of both baby and mother, reticulocyte count, Coomb's Test and urine for R/E. The investigations done in selective cases were chest radiography, plain radiography of abdomen, CSF study, blood culture, USG of hepatobilliary system, HBsAg, liver and thyroid function tests, TORCHS screening and G-6-phosphate dehydrogenase assay.

Statistical analysis

Data were collected using a structured questionnaire (research instrument) containing all the variables of interest. Data were processed and analysed using SPSS (Statistical Package for Social Sciences) version 11.5. The test statistics used to analyse the data were descriptive statistics, Chi-square (χ^2) test and Spearman correlation test. The level of significance was set at 0.05 and $p<0.05$ was considered significant.

Results

A total of 100 newborn babies with jaundice were included in the study. On admission, age of majority (84%) of the subjects was ⩽7 days and 16% was of >7 days. The mean age was 5.23 ± 2.65 days with the range 1 to 12 days. Sixty six patients were male and 34 were female with male to female ratio 2:1.

Birth weight of the babies

Seventy nine percent patients were born with normal birth weight, 19% had between 1.5–2.5 kg and 2% had between 1.0–1.5 kg. The mean birth weight was 2.71 ± 0.53 kg with the range 1.25–3.7 kg.

Table I shows the birth history of babies. About three-quarters (74%) of the mothers' gestational age ranged from 37–40 weeks, 24% below 37 weeks and 2% over 40 weeks. In 72% mothers the membrane ruptured before 12 hours of birth of the babies, in 19% cases within 12–24 hours and in 9% cases more than 24 hours of birth. History of prolonged labour, foetal distress and perinatal asphyxia were found in 26%, 25% and 30% cases respectively.

Table I: Distribution of subjects by birth history (n=100)

Birth history	Frequency	Percentage
Gestational age (weeks)		
<37	24	24
37–40	74	74
>40	02	2
Membrane rupture (hrs)		
<12	72	72
12–24	19	19
>24	09	9
Prolonged labour	26	26
Foetal distress	25	25
Perinatal asphyxia	30	30

Maternal illness

Fig 1 shows the maternal illness during antepartum period. Pre-eclamptic toxaemia (PET) was 11% followed by hypertension (8%), hydramnios (8%), fever (6%), eclampsia (4%), hyperemesis (4%), diabetes mellitus (2%) and APH (1%).

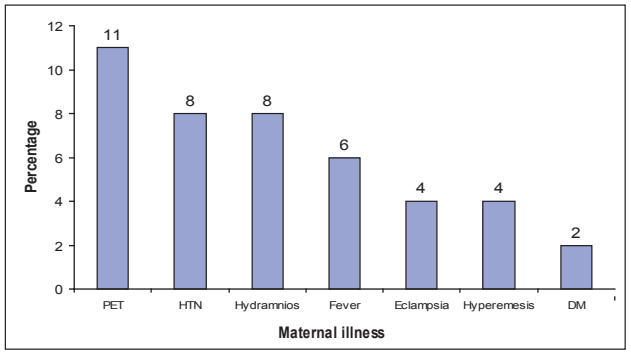

Fig 1. Maternal illness during antepartum period

Appearance of jaundice

One-third (33%) of the babies developed jaundice within 1–2 days after birth, 42% in 3–4 days, 20% in 5–6 days and only 5% after 6 days with mean 3.52 ± 1.64 days and range 1–9 days.

ABO blood groups

Fig 2 shows the ABO blood groups of mothers and babies. Thirty one percent of mothers and 37% of babies had blood group 'A', 31% mothers and 25% of babies had blood group 'B', 7% mothers and 6% babies blood group 'AB' and the rest 31% mothers and 32% babies had blood group 'O'.

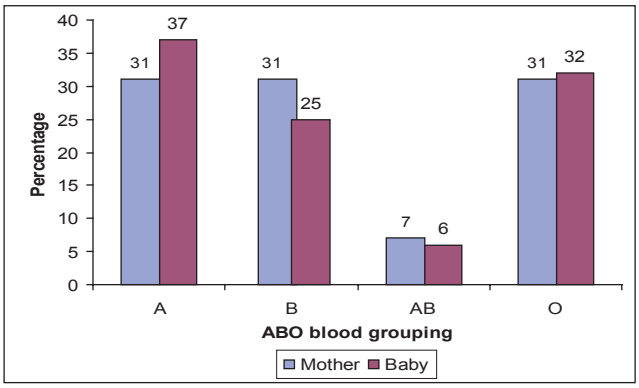

Fig 2. ABO blood groups of mothers and babies

Clinical examination findings

Table II shows the distribution of the newborns by clinical examination findings. Thirty nine percent of the newborns had moderate jaundice, 30% had severe, 18% mild and 13% had very severe jaundice. Only 5% of the newborns exhibited cephalhaematoma.

Table II: Distribution of patients by clinical examination findings (n=100)

Findings	Frequency	Percentage
Jaundice		
Mild	18	18
Moderate	39	39
Severe	30	30
Very severe	13	13
Cephalhaematoma		
Present	05	5
Absent	95	95

Laboratory investigation findings

Table III shows the laboratory investigation findings of the newborns. Thirty one percent of the patients had

direct serum bilirubin <1 mg/dL, 63% had 1–3 mg/dL and 6% had >3 mg/dL. Thirty five percent of the patients had indirect serum bilirubin 5–10 mg/dL, 30% had 10–15 mg/dL, 21% had >15 mg/dL and 14% had <5 mg/dL. Coomb's test was positive in 6% cases. Four patients were investigated for HBsAg – 2 were +ve and 2 were –ve.

Table III: Laboratory investigation findings of the newborns (n=100)

Laboratory investigation findings	Frequency	Percentage
Direct serum bilirubin (mg/dL)		
<1	31	31
1–3	63	63
>3	06	6
Indirect serum bilirubin (mg/dL)		
<5	14	14
5–10	35	35
10–15	30	30
>15	21	21
Coomb's test		
+ve	06	6
–ve	94	94
HBsAg (n=4)		
+ve	02	50
–ve	02	50

Diagnosis

Table IV shows the diagnoses based on clinical findings and laboratory investigations. More than one-quarter (28%) of the newborns had septicaemia followed by physiological jaundice (23%), asphyxia (20%), prematurity (18%), Rh incompatibility (15%), IUGR (11%), umbilical sepsis (6%), pneumonia (6%), ABO incompatibility (5%), UTI (4%), infective HBV, cephalhaematoma (2%), necrotising enterocolitis (2%) and DM (baby of diabetic mother) (2%).

Table IV: Distribution of patients by diagnosis (n=100)

Diagnosis	Frequency (%)
Septicaemia	28 (28)
Physiological jaundice	23 (23)
Asphyxia	20 (20)
Prematurity	18 (18)
Rh incompatibility	15 (15)
IUGR	11 (11)
Umbilical sepsis	6 (6)
Pneumonia	6 (6)
ABO incomaptibility	5 (5)
UTI	4 (4)
Infective HBV	2 (2)
Cephalhaematoma	2 (2)
Necrotising enterocolitis	2 (2)
DM	2 (2)

Total will not correspond to 100% because of multiple diagnoses

Correlation of gestational age and birth weight with serum bilirubin

Figures 3 and 4 show the correlation of gestational age and birth weight with serum bilirubin. Gestational age exhibits an inverse relationship with serum bilirubin (r= –0.344, p<0.001). Preterm babies tend to develop severe to very severe jaundice more significantly than the term babies. The birth weight of babies also shows inverse relationship with serum bilirubin (r= –0.369, p<0.001).

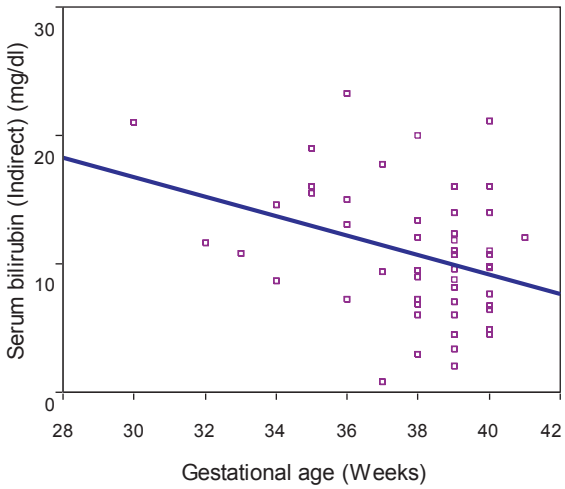

Fig 3. Correlation between gestational age and serum bilirubin

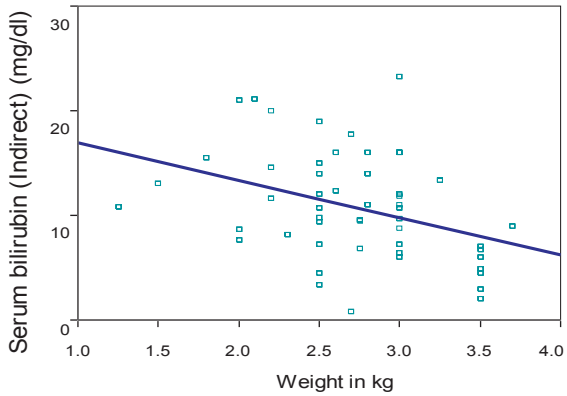

Fig 4. Correlation between birth weight and serum bilirubin

Birth weight and severity of jaundice

A significantly higher proportion of LBW newborns (71.4%) had severe to very severe jaundice while it was 45.6% in normal weight babies (p<0.05) (Table V).

Table V: Association between birth weight and severity of jaundice

Birth weight	Jaundice		p value
	Mild to moderate Number (%)	Severe to very severe Number (%)	
LBW (n=21)	6 (28.6)	15 (71.4)	<0.05
Normal (n=79)	43 (54.4)	36 (45.6)	

Data were analysed using Chi-square (χ^2) test

Management

Of the 77 patients who were treated, about 64% received phototherapy, 61% received antibiotics and very few (5.2%) received exchange transfusion.

Complications

The predominant complications of phototherapy were irritability (40.8%) followed by skin rashes (26.5%), loose motion (20.4%), dehydration (16.3%) and hyperthermia (4%).

Discussion

Jaundice is a common phenomenon in newborn infants. In most of the cases it is benign; but because of potential toxicity of bilirubin, newborn infants must be monitored to identify who might develop severe hyperbilirubinaemia.

In the present study the mean age of the jaundiced newborns at admission was 5.2 days, while the mean day of appearance of jaundice was 3.5 days indicating that the parents were conscious about seeking specialized care without delay. Most of the newborns (91%) exhibited jaundice 24 hours after birth and peaked by 3–4 days.

Nearly 5–25% of newborn babies develop pathological jaundice or hyperbilirubinaemia.[9] In this study 23% cases had physiological jaundice and 77% had one or more pathology. The present study was a hospital based study and probably very few cases of physiological jaundice were admitted in the hospital and this might be the reason of this difference.

In this study the commonest cause of pathological jaundice was septicaemia (28%) followed by asphyxia (20%), prematurity (18%), Rh incompatibility (15%), IUGR (11%), umbilical sepsis (6%), pneumonia (6%), ABO incompatibility (5%), UTI (4%) and cephalhematoma (2%). Khatoon & Islam[10] found that one-third (33.5%) was physiological jaundice, one-third (32.8%) was due to infection and the remaining one-third was caused by ABO incompatibility, Rh incompatibility, cephalhaematoma, neonatal hepatitis, intestinal obstruction and other unidentified causes. These are almost consistent with findings of the present study. A 10-year review of 41 thousand liveborn infants conducted by Palmar & Drew[11] presented a different picture of causes of pathological jaundice with prematurity being the commonest (19.9%) followed by ABO erythroblastosis (7.1%), sepsis (3.4%), Rhesus erythroblastosis (2.7%) and cephalhaematoma (2.2%). This study was carried out in Australia where the deliveries are conducted under aseptic conditions and environmental sanitation is beyond question and this may be the cause of low frequency sepsis. Linn[12] reported low birth weight, premature rupture of membranes, breastfeeding, neonatal infection, instrumental delivery as the independent risk factors for hyperbilirubinaemia. In another study UTI was found in 7.5% of asymptomatic afebrile jaundiced infants younger than 8 weeks old. The study also reported that infants with the onset of jaundice after 8 days of age or patients with an elevated conjugated bilirubin fraction were more likely to have UTI.[13]

Majority of the patients (79%) had birth weight 2.5 kg or more and the mean birth weight was 2.71 ± 0.53 kg. Three-quarters of the babies were born full-term. One-quarter (25%) of the mothers had prolonged labour with foetal distress, but because of absence of control group we cannot comment whether prolonged labour and/or foetal distress are risk factors for neonatal jaundice.

Distribution of ABO blood grouping in both mothers and babies were almost identical and majority of the mothers and babies was Rh +ve. Nearly one-third of the babies had severe and very severe jaundice while 40% exhibited moderate grade of jaundice. Half of the newborns (51%) had serum bilirubin (indirect) ⩾10 mg/dL. In this study 15% cases suffered from Rh incompatibility which seems to be higher compared to other studies.[14,15] This difference might be due to the fact that in our country no routine antenatal screening for Rh negativity is done and as such there is no universal intervention (immunoglobulin) for Rh negative mother caring Rh positive baby. Moreover, doctors and families in our country are more or less aware of the effect of Rh

incompatibility but not about the effect of ABO incompatibility. So admission of patients with known Rh incompatibility is more than patients with ABO incompatibility.

In this study serum bilirubin was found to exhibit negative correlation with gestational age. It indicates that higher the gestational age lower is the level of serum bilirubin. Preterm babies also tend to develop severe and very severe jaundice compared with the term babies ($p<0.001$). So the parents of babies born before 37 weeks of gestation should be cautious about the severity of jaundice in preterm babies so that they can take their babies to the nearest care centre as early as possible. Birth weight was also found to show negative correlation with serum bilirubin. Low birth weight (LBW) babies also have a significantly higher tendency to develop severe and very severe jaundice ($p<0.05$).

In this study, as almost half of the pathological jaundice was due to infection, managing 61% of the cases with antibiotics could be considered rational.

In this study the predominant complications of phototherapy were irritability (40.8%) followed by skin rashes (26.5%), loose motion (20.4%) and dehydration (16.3%). Hansen[16] reported insensible water loss and passage of loose stool during phototherapy. Abrol & Sankarasubramanian[17] observed short-term behavioural change of the term infant following phototherapy which can well be compared to irritability observed in the present study. However, they did not blame phototherapy to affect behavioural change of the infants; rather it may be attributed to maternal separation. Over one-quarter of the patients exhibited rash which is considered much higher compared to other studies.[18,19]

Neonatal jaundice is a leading cause of hospitalisation in the first few weeks of life throughout the world. Pathological jaundice is associated with significant morbidity and mortality. Proper evaluation of causes and timely and appropriate management would help to reduce complications of neonatal jaundice. Preventive strategy should be considered to reduce the incidence of neonatal jaundice.

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