ABSTRACT

BACKGROUND

Neonatal Hyperbilirubinaemia (NNH) is a significant cause of neonatal morbidity and prolongation of hospital stay, which in turn increases the chances of sepsis and mortality in the new-born period. Identification of the risk factors and timely detection and optimal management of NNH are thus crucial to prevent brain damage and subsequent neuromotor retardation due to bilirubin encephalopathy.

MATERIALS AND METHODS

This prospective study was carried out in M. G. M. Medical College and L. S. K. Hospital, Kishanganj (Bihar); 700 new-born babies delivered between December 2011 and June 2013, were included in the study. New-born babies who developed hyperbilirubinaemia were considered as ‘CASE’ and new-born babies with the same maternal factors, who did not develop hyperbilirubinaemia were considered as ‘CONTROL’. 100 cases and 600 control patients were studied. All parameters were taken during the hospital stay of the mother and baby, which was 5 - 7 days born (term and healthy babies are included only). Peripheral venous blood sample was drawn at the first appearance of significant clinical icterus according to Kramer’s criteria. Serum bilirubin estimation was done in the Biochemistry Department of this hospital.

RESULTS

Incidence of NNH is 16.67% of all live-born babies in our hospital, which has an annual delivery rate of approx. 4000. We have noted that the incidence of jaundice of the cases of OA incompatibility, the percentage of babies who develop hyperbilirubinaemia is 20%. Of the cases of OB incompatibility, the percentage of babies who develop hyperbilirubinaemia is 2.3%. If we take ABO incompatibility together, the incidence of hyperbilirubinaemia is 7.17%. In our series, Rh incompatibility was 4.16% and can be reduced by religious use of anti-D gamma globulin (Rho GAM) in all deliveries and miscarriages in the Rh negative mothers.

CONCLUSION

Blood group incompatibility as a whole is associated with increased incidence of hyperbilirubinaemia. ABO incompatibility does not have a significant impact on the incidence of NNH. Rh incompatibility is associated with increased incidence of neonatal hyperbilirubinaemia. Judicious use of inj. Anti-D immunoglobulin should be emphasised in suspected cases of Rh incompatibility to prevent NNH and its neurological effects. Early detection of maternal risk factors also should be done to prevent the development of NNH and kernicterus.

KEYWORDS

Neonatal Hyperbilirubinaemia, Kernicterus, Maternal Factors, ABO and Rh Incompatibility, Anti-D Immunoglobulins, Encephalopathy.


BACKGROUND

Neonatal jaundice is the commonest abnormal physical finding during the first week of life. Neonatal Hyperbilirubinaemia (NNH) is a significant cause of neonatal morbidity and prolongation of hospital stay, which in turn increases the chances of sepsis and mortality in the new-born period.

Jaundice is the commonest abnormal physical finding during the first week of life. Hyperbilirubinaemia is recognised as clinical jaundice in approximately 20% - 50% of full-term and 80% of preterm neonates. Identification of the risk factors and timely detection and optimal management of NNH are thus crucial to prevent brain damage and subsequent neuromotor retardation due to bilirubin encephalopathy.

Even following detailed laboratory investigations, paediatricians are often faced with a significant number of neonates with hyperbilirubinaemia where exact cause remains unidentified.

Therefore, at this day and age when early hospital discharge should be the norm, it is important to determine some factors which could be utilised to predict the occurrence of jaundice in otherwise healthy new-born.
Aims and Objectives
1. Incidence of neonatal hyperbilirubinaemia within the period of study.
2. Correlation of hyperbilirubinaemia with various maternal factors.
   - Mode of delivery.
   - Age of mother.
   - Blood group incompatibilities.
   - Use of OCP.
   - Maternal disease.
   - Type of feeding.
   - Nutritional status of mother.

MATERIALS AND METHODS
The study was carried out in M. G. M. Medical College and L. S. K. Hospital, Kishanganj (Bihar); 700 new-born babies delivered between December 2011 and June 2013, were included in the study.

New-born babies who developed hyperbilirubinaemia were considered as ‘CASE’ and new-born babies with the same maternal factors, who did not develop hyperbilirubinaemia were considered as ‘CONTROL’. 100 cases and 600 control patients were studied.

This was a prospective study. All parameters were taken during the hospital stay of the mother and baby, which was 5-7 days born (term and healthy babies are included only). Data was collected according to the proforma. All babies were examined in naked condition in natural day light for appearance of icterus. Peripheral venous blood sample was drawn at the first appearance of significant clinical icterus according to Kramer’s criteria. In new-born infants, progressive hyperbilirubinaemia is accompanied by a caudal advancement of dermal icterus which begins at the face and proceeds to the trunk, the extremities and finally to the palms and soles).

Conventionally, Neonatal Hyperbilirubinaemia (NNH) has been defined as bilirubin levels greater than 12.9 mg/dL in preterm babies and 15 mg/dL in term babies. These definitions are based on the data from the National Collaborative Perinatal Project data (CCP) conducted in the US from 1955 - 1961. Total serum bilirubin value of more than 12.9 mg/dL at any time during first week of life was considered as hyperbilirubinaemia in the present study.

The statistical constants have been calculated by standard methods. The tests of significance have been done by using chi square test.

Appropriate treatment in the form of phototherapy or exchange transfusion was given as per standard guidelines and protocols followed by the hospital.

Serum bilirubin estimation was done in the Biochemistry Department of this hospital. The method applied was Jendrassik and Grof technique. To identify aetiological spectrum, several investigations of baby were done: viz. ABO, Rh typing, DCT, reticulocyte count, haemoglobin estimation, peripheral smear, haematocrit, G-6 PD screening.

RESULTS

<table>
<thead>
<tr>
<th>Mode of Delivery</th>
<th>Babies without Hyperbilirubinaemia (n = 600)</th>
<th>Babies with Hyperbilirubinaemia (n = 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caesarean section</td>
<td>193 (32.17%)</td>
<td>24 (24.00%)</td>
</tr>
<tr>
<td>Instrumental</td>
<td>61 (10.17%)</td>
<td>16 (16.00%)</td>
</tr>
<tr>
<td>Normal vaginal delivery</td>
<td>346 (57.66%)</td>
<td>60 (60.00%)</td>
</tr>
</tbody>
</table>

Table 1. Occurrence of Hyperbilirubinaemia in Relation to Mode of Delivery

<table>
<thead>
<tr>
<th>Age (yrs.)</th>
<th>Babies without Hyperbilirubinaemia (n = 600)</th>
<th>Babies with Hyperbilirubinaemia (n = 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20</td>
<td>57 (9.50%)</td>
<td>10 (10.00%)</td>
</tr>
<tr>
<td>20-30</td>
<td>367 (61.17%)</td>
<td>62 (62.00%)</td>
</tr>
<tr>
<td>&gt; 30</td>
<td>176 (29.33%)</td>
<td>28 (28.00%)</td>
</tr>
</tbody>
</table>

Table 2. Occurrence of Hyperbilirubinaemia in Relation to Age of Mother

<table>
<thead>
<tr>
<th>Blood Group Incompatibility</th>
<th>Babies without Hyperbilirubinaemia (n = 600)</th>
<th>Babies with Hyperbilirubinaemia (n = 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OA Incompatibility</td>
<td>112 (18.67%)</td>
<td>20 (20.00%)</td>
</tr>
<tr>
<td>OB Incompatibility</td>
<td>192 (32.00%)</td>
<td>23 (23.00%)</td>
</tr>
<tr>
<td>Rh Incompatibility</td>
<td>14(2.33%)</td>
<td>25 (25.00%)</td>
</tr>
<tr>
<td>No blood group Incompatibility</td>
<td>282 (47.00%)</td>
<td>32 (32.00%)</td>
</tr>
</tbody>
</table>

Table 3. Occurrence of Hyperbilirubinaemia in Relation to Blood Group Incompatibility

<table>
<thead>
<tr>
<th>Blood Group Incompatibility</th>
<th>Babies without Hyperbilirubinaemia (n = 600)</th>
<th>Babies with Hyperbilirubinaemia (n = 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rh Incompatibility</td>
<td>14 (2.33%)</td>
<td>25 (25.00%)</td>
</tr>
<tr>
<td>No Rh Incompatibility</td>
<td>586 (97.67%)</td>
<td>75 (75.00%)</td>
</tr>
</tbody>
</table>

Table 4. Tables Considering Individual Blood Group Incompatibilities

<table>
<thead>
<tr>
<th>Maternal Disease</th>
<th>Babies without Hyperbilirubinaemia (n = 600)</th>
<th>Babies with Hyperbilirubinaemia (n = 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDM</td>
<td>93 (15.50%)</td>
<td>14 (14.00%)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>60 (10.00%)</td>
<td>11 (11.00%)</td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td>17 (2.83%)</td>
<td>3 (3.00%)</td>
</tr>
<tr>
<td>None</td>
<td>430 (71.67%)</td>
<td>72 (72.00%)</td>
</tr>
</tbody>
</table>

Table 5. Occurrence of Hyperbilirubinaemia in Relation to Maternal Disease
The data in the table show that exclusively breast-fed babies have a higher incidence of hyperbilirubinemia compared to formula-fed babies. In the study, 570 of 600 exclusively breast-fed babies (95.00%) had hyperbilirubinemia, while only 98 of 100 formula-fed babies (98.00%) did. This trend is consistent with previous studies indicating that breast milk can inherently lower the risk of hyperbilirubinemia, possibly due to its protective factors.

**Table 6. Occurrence of Hyperbilirubinemia in Relation to Type of Feeding**

<table>
<thead>
<tr>
<th>Type of Feeding</th>
<th>Babies without Hyperbilirubinemia (n = 600)</th>
<th>Babies with Hyperbilirubinemia (n = 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusively breast fed</td>
<td>570 (95.00%)</td>
<td>98 (98.00%)</td>
</tr>
<tr>
<td>Formula fed</td>
<td>30 (5.00%)</td>
<td>2 (2.00%)</td>
</tr>
</tbody>
</table>

**DISCUSSION**

In India, incidence of NNH varied from 4.3% to 6.5% of all live born babies. Recently, incidence of significant hyperbilirubinemia is documented as 10.5% in term live born babies and 25.3% in near term group.

Incidence of NNH is 16.67% of all live born babies in our hospital, which has an annual delivery rate of approx. 4000.

Premature babies have much higher incidence of neonatal jaundice requiring therapeutic intervention than term newborns. Neonates with untreated, severe hyperbilirubinemia (defined as serum total bilirubin level > 20 mg/dL) can develop signs of acute bilirubin encephalopathy. If not treated immediately, they might go on to develop kernicterus, a chronic neurologically devastating condition resulting from bilirubin toxicity.

We have noted that the incidence of jaundice of the cases of OA incompatibility, where the mother is of ‘O’ blood group and the baby is of ‘A’ blood group, the percentage of babies who develop hyperbilirubinemia is 20%. Of the cases of OB incompatibility, where the mother is of ‘O’ blood group and the baby is of ‘B’ blood group, the percentage of babies who develop hyperbilirubinemia is 23%. If we take ABO incompatibility together, the incidence of hyperbilirubinemia is 7.17%.

It is always our temptation to suspect more incidence of neonatal jaundice if mother is ‘O’ and baby is either ‘A’ or ‘B’. It is interesting that the studies carried out in different institutions, one in early 60’s and the other in early 70’s have shown that OA, OB and total ABO incompatibility in mother and baby pairs had higher incidence of NNH and according to those studies a baby with ABO incompatibility had 1.75 times more incidence of jaundice than other mothers and child combination (except Rh incompatibility). Though blood group incompatibility as a group is more significantly associated with NNH in the present study, it is mostly due to incompatibility of Rh group causing jaundice. Rh incompatibility in late 80’s was 9.8%, in our series Rh incompatibility was 4.16%; it is comparable to the incidence of Rh incompatibility carried out in different institutions. The incidence of NNH in Rh incompatibility can only be decreased by the religious use of anti-D gamma globulin (Rho GAM) in all deliveries and miscarriages in the Rh negative mothers. In the previous study different hospital, the non-ABO, non-Rh group played a significant contribution towards causing jaundice. In the present study, in 52% of cases of NNH there was no ABO or Rh incompatibility and we could not correlate other confounding factors. Therefore, maternal blood group other than Rh negative cannot give us sufficient signal that jaundice will occur in their babies or not.

Though maternal age, parity, use of OCP at the time of conception and maternal disease played a predictive role in causation of NNH in certain studies, the present study does not show any statistically significant evidence that these factors may play a role in NNH. Malnourished mother and mother from poorer background with lower per capita income may be at higher risk hyperbilirubinemia. However, the present study has conclusively proved that there is no statistically significant association of per capita income and nutritional status of mother with NNH and maternal malnutrition may be blamed for IUGR, but cannot be blamed for higher incidence of NNH.

**CONCLUSIONS**

All the maternal factors included in this study could not clearly predict the incidence of NNH, which continues to be a problem towards early discharge of normal new-born babies.

Blood group incompatibility as a whole is associated with increased incidence of hyperbilirubinemia. ABO incompatibility does not have a significant impact on the incidence of NNH. Rh incompatibility is associated with increased incidence of neonatal hyperbilirubinemia. Judicious use of inj. Anti-D immunoglobulins should be emphasised in suspected cases of Rh incompatibility to prevent NNH and its neurological effects.

Early detection of maternal risk factors also should be done to prevent the development of NNH and kernicterus.

Maternal age, mode of delivery, parity of mother, use of OCP at the time of conception, maternal disease, nutritional status of mother, type of feeding of new-born - all these factors do not have any association with neonatal hyperbilirubinemia.

**Limitation of the Study**

In our hospital, we get middle class and lower middle class pregnant women. So, it is not surprising that there would not be any significant alteration in incidence of jaundice among the above variable.

**Scope for Further Research**

If this study could be done in a hospital where people from all status of society, all nutritional status and all per capita income avail the resources, then it would be a good indicator to point out whether poverty or maternal malnutrition could be a factor in the incidence of NNH.

**REFERENCES**