Neonatal Hyperbilirubinemia: Magnitude and Associated Etiologic Factors among Neonates Admitted at Tikur Anbessa Specialized Hospital, Ethiopia

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Abstract

Background: Neonatal Hyperbilirubinemia is a recognized cause of brain damage and bilirubin encephalopathy resulting in long-term sequel like sensory-neuronal hearing loss in the survivors and death.

Objective: To assess magnitude and associated factors of neonatal Hyperbilirubinemia among neonates admitted Tikur Anbessa Specialized Hospital.

Methods and materials: Cross sectional study was conducted. A total of 356 study subjects were recruited in this study. A systematic sampling method was employed to select the desired sample size. Data was first entered to Epi Info version 7 and exported to SPSS version 20.0 to clean and analyze data.

Result: Among 356 total neonates, 160(44.9%) of them were diagnosed for hyperbilirubinemia. From these, 11(6.9%) neonates developed bilirubin encephalopathy. Prevalence of neonatal hyperbilirubinemia among male neonates was 89(47.8%) whereas 71(41.8%) was in females. Mean age of neonates at admission with hyperbilirubinemia was 5.29 days. Major etiologic factors of neonatal hyperbilirubinemia were ABO incompatibility and sepsis which accounts 57(36.6%) and 30(18.8%) respectively.

Conclusions: Magnitude of neonatal hyperbilirubinemia was quite high. Major factors causing hyperbilirubinemia in neonates were ABO incompatibility, sepsis, Rh isoimmunization, idioopathic cause and breast feeding jaundice. Early prevention and timely treatment of hyperbilirubinemia in neonates is important to prevent or reduce neonatal death due to hyperbilirubinemia.

Keywords: Neonatal hyperbilirubinemia; Neonatal jaundice; ABO incompatibility; Rh incompatibility; Ethiopia

Background

Neonatal Hyperbilirubinemia is a serum bilirubin greater than 85 μmol/L (5 mg/dL). It is the yellowish discoloration of the skin, sclera and mucous membranes resulting from deposition of bilirubin [1]. Neonatal hyperbilirubinemia is attributed to increased red blood cells volume per weight, decreased red blood cells life span, increased enter hepatic circulation and defective uptake of bilirubin. It is caused by an increased production of bilirubin from senescent fetal red blood cells and/or limited bilirubin elimination in the newborn infant. Newborn's immature liver often cannot remove bilirubin quickly enough, causing hyperbilirubinemia [2].

Hyperbilirubinemia in neonates can causes kernicterus (bilirubin encephalopathy). Kernicterus is caused by unconjugated hyperbilirubinemia that develops either as a result of hemolytic disease such as Rh incompatibility or because of inability of the liver to conjugate bilirubin due to either defect of glucuronyl transferase enzyme or when this enzyme is not fully functional [3-7]. There are certain factors that influence the passage of bilirubin into the brain and hence increase the risk of acute bilirubin encephalopathy. Among the, preterm birth, sepsis, hypoxia, seizures, acidosis and hypoalbuminemia were the most common. The rate of rise of the level of bilirubin is equally important hence the increased risk of kernicterus in babies with hemolytic disease such as G-6PD deficiency, ABO or Rhesus hemolytic disease [8-10].

Recent global study estimates that about 1.1 million babies would develop hyperbilirubinemia with or without bilirubin encephalopathy worldwide yearly [11,12]. Among those neonates 481,000 were term neonates of whom 114,000 were die annually and more than 63,000 survive with moderate or severe disability. The vast majority, 75% of affected neonates reside in sub-Saharan Africa, the region where Ethiopia located and South Asia [13-18].

In Africa, neonatal jaundice is commonly associated with sepsis which is a major contributor to neonatal mortality [19-24]. Neonatal morbidity and mortality remain very high in developing countries of Sub-Saharan Africa and one of the important contributors to this morbidity and mortality is neonatal Hyperbilirubinemia [25,26].

Severe neonatal hyperbilirubinemia can be said to have modifiable associated factors particularly in developing countries [27-30]. According to Israel-Aina Y and Omoigberale A on risk factors for neonatal jaundice in babies presenting at the University of Benin Teaching Hospital neonatal sepsis, prematurity, G-6PD deficiency are among risk factors of neonatal hyperbilirubinemia [30]. In Australia over a ten-year period, Palmer and Drew found different associated factors of jaundice in infants such as sepsis (3%), bruising (2%) and G-6PD deficiency [31]. This study is aimed to assess the magnitude and etiologic factors of neonatal hyperbilirubinemia among neonates admitted at Tikur Anbessa Specialized Hospital.

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Methods and Materials

Institutional based cross-sectional study design was conducted. The study was conducted in Tikur Anbessa Specialized Hospital (TASH) which is located in Addis Ababa Ethiopia. The hospital provides a tertiary level of health care service and serves for approximately 370,000-400,000 patients per year in all wards. TASH is the largest and oldest teaching hospital in the country. Sample size was calculated using single proportion formula by the following assumption, Proportion of neonatal hyperbilirubinemia as 35%, confidence interval (95%) and 5% margin of sampling error was tolerated. This gives a total sample size of 356 neonates. Systemic sampling method was used to select the desired sample size. Cards of neonates admitted at NICU of TASH from September 11/2014 to September 11/2017 were isolated and counted. Data was first entered to Epi Info version 7 and exported to SPSS version 20.0 to clean and analyze data. Frequency was used to describe the parameters investigated. Confidence interval of 95% was used to see the precision of the study and the statistical association was considered as significant if p-value was less than 0.05.

Results

A total of 356 neonates were recruited in this study. One hundred eighty six (52.2%) of them were males. Age of 176 (49.4%) neonates was 3–6 days old at admission. Weight of 241 (67.7%) neonates was 2500 g–4000 g at admission. Duration of hospital stay was 1 to 25 days. More than half of them (n=231(64.9%), were discharged from hospital within a week after admission where as 55(15.4%) of neonates were discharged within 2 days. A total of 135 (37.5%) neonates were preterm babies (Table 1).

Among 356 total neonates, 160(44.9%) of them were diagnosed for hyperbilirubinemia. From these, 111(6.9%) neonates developed bilirubin encephalopathy. Prevalence of neonatal hyperbilirubinemia among male neonates was 89(47.8%) whereas 71(41.8%) was females. Mean age of neonates at admission with hyperbilirubinemia was 5.29 days. From these, 84(52.5%) of them were 3–6 days old at admission. Mean age of neonates who had hyperbilirubinemia was 5.29 days. Mean weight of neonates who had Hyperbilirubinemia was 2983.24 g.

From 160 neonates who had hyperbilirubinemia, 39(44.4%) of them were preterm babies.

Table 1: Socio-demographic characteristics of neonates TASH, Ethiopia, 2017.

<table>
<thead>
<tr>
<th>Socio-demographic characteristics</th>
<th>Category</th>
<th>N=356* N (%)</th>
<th>N=160** N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
<td>186(52.2)</td>
<td>89(55.6)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>170(47.8)</td>
<td>71(44.4)</td>
</tr>
<tr>
<td>Age at admission (days)</td>
<td>Less/equal 2</td>
<td>100(28.1)</td>
<td>24(15)</td>
</tr>
<tr>
<td></td>
<td>3–6</td>
<td>176(49.4)</td>
<td>84(52.5)</td>
</tr>
<tr>
<td>Weight (grams)</td>
<td>Greater than 6</td>
<td>80(22.5)</td>
<td>52(32.5)</td>
</tr>
<tr>
<td></td>
<td>Less than 2500</td>
<td>104(29.2)</td>
<td>25(15.6)</td>
</tr>
<tr>
<td></td>
<td>Greater/equal to 4000</td>
<td>241(67.7)</td>
<td>127(79.4)</td>
</tr>
<tr>
<td>Gestational age (weeks)</td>
<td>Less than 37 weeks</td>
<td>135(37.9)</td>
<td>39(24.4)</td>
</tr>
<tr>
<td></td>
<td>Greater/equal to 37 weeks</td>
<td>199(55.9)</td>
<td>99(61.9)</td>
</tr>
<tr>
<td>Hospital stay (days)</td>
<td>Unknown</td>
<td>22(6.2)</td>
<td>22(13.8)</td>
</tr>
<tr>
<td></td>
<td>Less than 7</td>
<td>231(64.9)</td>
<td>116(72.5)</td>
</tr>
<tr>
<td></td>
<td>Greater/ equal to 7</td>
<td>125(35.1)</td>
<td>44(27.5)</td>
</tr>
</tbody>
</table>

* Among total neonates
** Among neonates with NH

Mean onset of hyperbilirubinemia in neonates with hyperbilirubinemia was 2.13 days. Neonates with hyperbilirubinemia who were less than 3 days old account 66.2%. The onset of jaundice among 11 neonates with bilirubin encephalopathy 7(44.4%) were from 3–6 days old after birth. Onset of neonatal hyperbilirubinemia mostly occurred in less than 3 days old after birth.

The major causes of neonatal hyperbilirubinemia in this study were ABO incompatibility and sepsis which accounts 57(35.6%) and 30(18.8%) respectively. It was found that there was more than one etiologic factor for neonatal hyperbilirubinemia. Neonates with hyperbilirubinemia who had sepsis and ABO incompatibility were 4(2.5%). Sepsis was among the leading cause of neonatal hyperbilirubinemia in this study. Among 160 neonates with neonatal hyperbilirubinemia blood culture of 39(24.4%) neonates was done and blood culture of 4(2.5%) neonates were negative (no growth) but 35(21.9%) of them had positive result of blood culture. All neonates with hyperbilirubinemia were treated either by phototherapy alone or both phototherapy and exchange blood transfusion. Among jaundiced neonates, 139(86.9%) of them were treated by phototherapy alone and the rest 21(13.1%) were treated with exchange blood transfusion combined with phototherapy. From these, 10(47.6%) of them developed bilirubin encephalopathy. Neonatal death among those with neonatal hyperbilirubinemia was 5(3.1%) in this study. Among those died, 3(60%) of them were due to bilirubin encephalopathy (Table 2).

Discussions

In this study prevalence of neonatal hyperbilirubinemia was 160(44.9%) of which 111(6.9%) neonates were developed bilirubin encephalopathy which is much higher than a study conducted in West Indian University, 4.6% [25]. It was also quit high finding compared to a study conducted in Pakistan which was 27.6% [32,33]. A study conducted in Nigeria found that the prevalence of NH was 35% of which 9.7% neonates were developed bilirubin encephalopathy [34]. Other study in Benin 2012 showed that magnitude of NH was 26.5% of which 12.7 % of them were died. Recent study in Gondar university hospital, Ethiopia on predictors of neonatal morbidity and mortality showed that magnitude of NH among 325 neonates admitted at NICU were 103(31.7%) of which 33(32%) were expired [28,35-41].

This study found that most affected age group by NH was 3–6 days old at admission which was 52.5% and those ≥6 days old were 32.5% [42-45]. Other study conducted in Egypt by Muhammad A, 2011 showed that prevalence of neonatal hyperbilirubinemia in 4–7 days old neonates was 27.9% and ≥ 8 days old neonates were 26.8% [17]. Other study in Egypt 2014, indicated that 50% of jaundiced neonates were from 4-7 days old and 13.83% were ≥7 days old after birth [44].

Table 2: Distributions of etiologic factors of NH among neonates with hyperbilirubinemia in TASH, Ethiopia, 2017.

<table>
<thead>
<tr>
<th>Associated factors of hyperbilirubinemia</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prematurity</td>
<td>13</td>
<td>8.1</td>
</tr>
<tr>
<td>Breast milk jaundice</td>
<td>10</td>
<td>6.3</td>
</tr>
<tr>
<td>Breast feeding jaundice</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Sepsis</td>
<td>30</td>
<td>18.8</td>
</tr>
<tr>
<td>Rh incompatibility</td>
<td>14</td>
<td>8.8</td>
</tr>
<tr>
<td>ABO incompatibility</td>
<td>57</td>
<td>35.6</td>
</tr>
<tr>
<td>G6-PD deficiency</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Idiopathic cause of jaundice</td>
<td>22</td>
<td>13.8</td>
</tr>
<tr>
<td>Other known cause of jaundice</td>
<td>13</td>
<td>8.1</td>
</tr>
<tr>
<td>Hemolytic cause of jaundice</td>
<td>10</td>
<td>6.2</td>
</tr>
</tbody>
</table>
Current study showed that 99.4% of neonates were developed NH in the 1st week of life. Similarly study done in Benin 2012 (40) showed all neonates were developed NH in the 1st week of life after birth and in Nigeria 2011, 89.6% of jaundiced neonates developed NH in the 1st week of life [34]. Other study by Omekwe DE et al. showed 41.2% neonates were developed NH at 1-2 days old after birth [29]. In Pakistan by SS Tikmani et al. 64% of neonates were developed hyperbilirubinemia between 0 and 6 days after birth [3].

Among etiologic factors of NH, this study found that ABO incompatibility (35.6%), sepsis (18.8%), breast feeding (10%) and prematurity (8.1%) were the most etiologic factors. Similar study in West India University, indicated that ABO incompatibility (35%), prematurity (11%) and Rh incompatibility (3.5%) were NH associated factors [25]. Study in Benin showed that associated factors of NH were ABO incompatibility (7.6%) and sepsis (45%) [45].

Conclusion and Recommendation

Magnitude of neonatal hyperbilirubinemia was quite high. Major factors causing hyperbilirubinemia in neonates were ABO incompatibility, sepsis, Rh isoimmunization, idiochopic cause and breast feeding jaundice. Early prevention and timely treatment of hyperbilirubinemia in neonates is important to prevent or reduce neonatal death due to hyperbilirubinemia.

References


