Epidemiology of Neonatal Hyperbilirubinemia in Niamey: about 146 Cases Collected at Issaka Gazobi Maternity Hospital

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Abstract

Neonatal hyperbilirubinemia is a major morbidity and mortality factor, especially in a context of early exit of newborns. This study is aimed at determining the frequency of this pathology and characterizing its epidemiological aspects in the Neonatology Department at Issaka Gazobi Maternity Hospital in Niamey. This is a descriptive and cross-sectional monocentric study, expanding over 5 months in the Neonatology Department. It involved newborns with local or generalized jaundice and hospitalized in the Neonatal Department.

The frequency of neonatal jaundice was 19.5%, with a gender ratio of 1.92. On average, mothers were aged 26.4 ± 4.2 years and almost half (46.4%) of them were under 25 years old. 64.3% were term births against 35.7% of preterm births. This was due to prophylactic caesarean section (32.3%), premature membrane rupture (17.7%), fetal suffering and severe pre-eclampsia 11.8% respectively. Etiologies of these jaundices were dominated by infections (39%), neonatal malaria (17.1%) and fetal-maternal incompatibility in the ABO/Rh system (15.7%). Development was good in 69.65% of cases against 10.7% of deaths.

Infections, neonatal malaria and maternal-fetal incompatibility are the main etiologies of neonatal hyperbilirubinemia in Niamey. Mortality rate related to this pathology is very high.

Keywords: Hyperbilirubinemia, Neonates, Jaundice, Niamey.

I. INTRODUCTION

Bilirubin is the product of the catabolism of hemoglobin and some hemoproteins. The specificities of bilirubin metabolism in the neonatal period justifies the frequency of severe jaundice occurrences during this period of life. Indeed, in newborns, hyperbilirubinemia results from the excessive production of unconjugated bilirubin associated with low elimination due to hepatic immaturity and high intestine reabsorption. The incidence of neonatal hyperbilirubinemia is around 60% in term infants and more than 80% in preterm infants, according to Watchko [1]. Neonatal hyperbilirubinemia remains therefore a major concern due to its neurotoxin effects which generate long term consequences [2]. This is a major factor of morbidity and mortality during the neonatal period [3, 4]. Pathological neonatal Hyperbilirubinemia tends to be related to severe hemolysis of infectious or immunological origin, or red cell enzyme deficiency [5]. Neonatal jaundice risk factors also include breastfeeding type, primiparity, mothers’ young age, difficult labor, asphyxia at birth [6]. Despite its multiple risk factors, the real incidence of pathological neonatal jaundice is misunderstood at Issaka Gazobi Maternity Hospital, due to the absence of documented work. In addition, the current context of early exit of newborns at Issaka Gazobi Maternity Hospital has given impetus to the issue of severe hyperbilirubinemia diagnosis and management. To bridge this gap, this study is at determining the frequency of neonatal jaundice and characterizing the epidemiological aspects of hyperbilirubinemia in the Neonatology Department of Niamey.

II. PATIENTS AND METHODS

This is a descriptive, cross-sectional, monocentric study carried out over a period of 5 months (November 2015 to March 2016) in the neonatology department of the Issaka Gazobi maternity in Niamey.

A. Patients

1. Study Population

The study population includes all newborns hospitalized in the Neonatology Department.
2. **Sampling**

The sample for this study included newborns with local or generalized jaundice during the period covered by this study.

3. **Inclusion Criteria**

Newborns with medical files containing all clinical information and a biological examination including at least a blood count, bilirubin levels, ABO/Rh blood typing of infants and mothers as well as direct Coombs test are covered by this study.

4. **Non-inclusion criteria**

Newborns referred to the Neonatology Department by others health facilities and those with no bilirubin levels and blood count in their examination files were excluded from this study.

B. **Methods**

1. **Biological tests**

Venous blood samples were taken from newborn heels and transferred into EDTA micro tubes for blood count purposes and into dry micro tubes without anticoagulant for the determination of bilirubin. Blood count was conducted within the hour following sampling on an Abbott Diagnostics “Cell Dyn 1800” type of automated cell counter. Anemia is determined when hemoglobin level is below 14g/dl in newborns. For the bilirubin assay, the whole blood sample is centrifuged at 2500 rpm for 5 minutes to extract the serum. In the presence of diazotized sulphanilic acid and in alkaline media, bilirubin forms a red coloured compound whose intensity is proportional to the concentration of bilirubin in the sample. Conjugated bilirubin reacts directly in aqueous solution, while free bilirubin requires solubilization in DMSO before reaction. Bilirubins are measured at 405 nm with Cypress reagents using a Cypress Diagnostic Cyan Plus semi-automatic spectrophotometer. A serum bilirubin level above 150 mg/l is considered a threshold that may cause adverse effects in the newborn.

2. **Data collection**

Data were collected from the medical files of mothers and infant health cards and then transferred on pre-established individual survey forms.

3. **Ethics**

The study was approved by the National Scientific Committee and is free of any conflicts of interest. Parents who were involved in this study agreed by informed consent.

4. **Studied Parameters**

Parameters studied included mothers’ age and level of education, pregnancy term, delivery method, caesarian section reasons, sex of newborns, birth weight, total bilirubin levels, haematological parameters and exit methods.

5. **Data Analysis**

Data were entered and analyzed on EPI info 5.3.1. The STUDENT test was used to compare quantitative variable averages and chi-2 for qualitative variables. The significance level was set at P < 5%.

III **RESULTS**

During the period under review, 146 newborns were eligible, and distributed in groups of 96 boys and 50 girls (sex ratio 1.92), with jaundice out of a total of 750 births, i.e. 19.5% of births during the same period.

The age of mothers was 26.4 ± 4.2 years with extremes ranging from 15 years to 44 years and almost half of them (46.4%) were aged between 15 and 24 years. Most of them were illiterate and housewives (58.9%).

Based on the term of pregnancy, 64.3% of newborns were term infants and 35.7% were preterm infants (35-37 SA). Newborns whose birth weight was below 2,500g represented 30.4%, while those with birth weights above 2,500g represented 12.50% of cases. Caesarean deliver method was used in 60.7% of cases against 39.3% for vaginal delivery.

A. **Reasons for Caesarian section**

The main reasons provided included the prophylactic role of Caesarean section (32.3%), premature rupture of membranes (17.7%), fetal distress and Severe pre-eclampsia represented 11.8% of cases, each (Table I).

<table>
<thead>
<tr>
<th>Reasons for Caesarian section</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prophylactic caesarean section</td>
<td>11</td>
<td>32.3%</td>
</tr>
<tr>
<td>Premature membrane rupture</td>
<td>6</td>
<td>17.7%</td>
</tr>
<tr>
<td>Fetal suffering</td>
<td>4</td>
<td>11.8%</td>
</tr>
<tr>
<td>Severe pre-eclampsia</td>
<td>4</td>
<td>11.8%</td>
</tr>
<tr>
<td>Suspicion of disunity</td>
<td>2</td>
<td>5.9%</td>
</tr>
<tr>
<td>Stationary Dilatation</td>
<td>2</td>
<td>5.9%</td>
</tr>
<tr>
<td>Poly malformation</td>
<td>1</td>
<td>2.9%</td>
</tr>
<tr>
<td>Oligohydramnios</td>
<td>1</td>
<td>2.9%</td>
</tr>
<tr>
<td>Retropelacental</td>
<td>1</td>
<td>2.9%</td>
</tr>
<tr>
<td>Hematoma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intra-uterine growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retardation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table I: Reasons for Caesarian section
B. Etiologies of jaundices

Depending on the intensity of jaundice, 80.3% had frank icterus against 19.7% of subictus cases. Various etiologies are summarized in table II

<table>
<thead>
<tr>
<th>Etiologies of jaundices</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonatal infections</td>
<td>57</td>
<td>39%</td>
</tr>
<tr>
<td>Neonatal malaria</td>
<td>25</td>
<td>17.1%</td>
</tr>
<tr>
<td>Maternal fetal Incompatibility</td>
<td>23</td>
<td>15.7%</td>
</tr>
<tr>
<td>Physiological jaundice</td>
<td>15</td>
<td>10.3%</td>
</tr>
<tr>
<td>Prematurity</td>
<td>13</td>
<td>8.9%</td>
</tr>
<tr>
<td>Unknown Causes</td>
<td>13</td>
<td>8.9%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>146</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Neonatal infections represented the main etiology of monitored jaundices, followed by neonatal malaria.

C. Hemogram study

Anemia (Hb <14g/dl) was present in 17.9% of these newborns, thrombocytopenia in 10.7% and leukopenia in 1.8% of newborns (Table III).

<table>
<thead>
<tr>
<th>Hemogram</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>White cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyperleukocytosis</td>
<td>30</td>
<td>53.6%</td>
</tr>
<tr>
<td>Normal</td>
<td>25</td>
<td>44.6%</td>
</tr>
<tr>
<td>Leukopenia &gt;14g/dl</td>
<td>46</td>
<td>82.1%</td>
</tr>
<tr>
<td>Hemoglobin &lt;14g/dl</td>
<td>10</td>
<td>17.9%</td>
</tr>
<tr>
<td>Thrombocytosis</td>
<td>7</td>
<td>12.5%</td>
</tr>
<tr>
<td>Normal</td>
<td>43</td>
<td>76.8%</td>
</tr>
<tr>
<td>Thrombocytopenia</td>
<td>6</td>
<td>10.7%</td>
</tr>
</tbody>
</table>

D. Bilirubinemia depending on the term of pregnancy

The study shows that 53.8% of premature infants and 41.5% of term infants had hyperbilirubinemia above 150mg/L. Table IV summarizes the intensity of bilirubinemia depending on the term of pregnancy.

<table>
<thead>
<tr>
<th>Delivery</th>
<th>Intensity of bilirubinemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preterm</td>
<td>&lt;150</td>
</tr>
<tr>
<td>Term</td>
<td>55</td>
</tr>
</tbody>
</table>

E. Newborn exit method

Figure 1 shows delivery methods for newborns at the Maternity. Almost 1 out of 10 newborns died from complications and in 18% of cases, the delivery method was not mentioned in medical files.

IV. DISCUSSION

During the period under review, neonatal jaundice was present in 19.5% of newborns at Issaka Gazobi Maternity Hospital. This result is significantly higher than those reported by Mutombo [7] in DRC and Olusanya [4] in Nigeria of respectively 4.9% and 6.7%. Our findings were however closer to those of Rasul [8] which stood at 22%. The frequency of neonatal jaundice occurrence also varies according to the stage of pregnancy. Indeed, Sarici [9] noted in their series that newborn jaundice was present in 10.5% and 25.3% respectively of full term newborns and preterm newborns. Variation in results observed across studies would be attributable to selection criteria used, study environment and type, breastfeeding method, communities socio-cultural habits and genetic factors, including blood groups of variable frequency.

Gender distribution shows a high proportion of male newborns with a sex ratio of 1.92. A sex ratio of 1.8 in newborn jaundice was reported by Mutombo in DRC [7]. Predominance of male newborns led us to the hypothesis that males would be more fragile and therefore they would be more exposed to hyperbilirubinemia than females due to GPD deficit often observed in boys. This hypothesis is corroborated by Carolyn [6] and Tioseco [10] who also stressed that male sex was a risk factor associated with the occurrence of neonatal jaundice.

It was noted that the average age of mothers was 26.4 years and almost 87.5% were less than 34 years.
old, including 46.43% who were under 24 years. In terms of education, 58.9% did not attend primary school. Similar results were reported by Olusanya in Lagos, Nigeria [4] with an average age of 28.0 ± 5.18 years and low level of education. Immature age, illiteracy and limited economic resources might be constraints which limit the number of prenatal consultations likely to detect on time neonatal jaundice risks.

Low birth weight (<2000g) was observed in our series in 30.40% of newborns, including 21.42% premature infants. Fetal suffering of all kinds as well as maternal fetal infections may justify the high proportion of low birth weight and premature childbirths.

Caesarean deliveries represented 60.7% of cases and the main reasons for this procedure included prophylactic caesarean section (32.30%), RPM (17.70%), fetal suffering and Severe pre-eclampsia with 11.8% each. This high rate of caesarean section may be justified by the fact that this study was conducted in a reference maternity hospital where the majority of cases referred are emergencies. Among etiologies identified, neonatal infections were ranked first in 39% of case, followed by neonatal malaria in 19.20% of cases ABO/Rh incompatibility in 15.7% of cases. Infectious origin as the major cause of neonatal hyperbilirubinemia was also mentioned by Mutombo et al [7] in their series. For others authors, however, ABO/Rh incompatibility is the main cause of pathological hyperbilirubinemia etiologies [11], [12]. Other risk factors often mentioned in the literature include red cell constitutional abnormalities, mainly glucose-6-phosphate dehydrogenase deficiency [13], [14], [15]. Though we could not determine the activity of G6PD in our sample, previous studies showed high prevalence of this enzymopathy within our population [16], [17]. Thus, the high number of unspecified etiologies (6.8%) that we identified during this study might inter alia be related to this enzymopathy.

With regard to serum bilirubin, 53.8% of preterm newborns had developed severe hyperbilirubinemia above 150 mg/l contrary to term newborns (41.5%) (P=0.023). Preterm newborns are more likely to produce indirect bilirubin, though they are unable to excrete it. This high frequency of hyperbilirubinemia justifies the introduction of tight and strict monitoring through the determination of transcutaneous bilirubin a non invasive method which is well correlated with serum essays [18]. In our study, anemia, thrombocytopenia and leukopenia were identified in 17.8%, 10.7% and 1.8% of cases. Cases of cytopenia, especially anemia, were noted by Isa et al. [19] particularly in the event of G6PD deficiency.

11% of cases had a fatal outcome. Cases of death were mentioned by Mutombo et al [7] and Hassan et al [20] with 9.16% and 0.7% respectively in their series. Several risk factors were underlined in our series, including inter alia poor conditions of mothers, their young age, absence of prenatal consultations and delayed management. We noted that in 18% of cases, the reason for exit was not mentioned in medical files. This might be justified by evasions and/or negligence in data collection. Mutombo [7] et al also noted 10 cases (8.33%) of exit by evasion or against medical opinion.

V. CONCLUSION

Neonatal hyperbilirubinemia is very common in our study. Infections, neonatal malaria and fetomaternal incompatibility are the main etiologies in our study. Prevention against these etiologies and early detection will reduce mortality. Attention should also be paid to early maternity leave, escapes and delays in the management of this pathology.

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CONFLICT OF INTEREST

The authors declare having no conflict of interest regarding this article.

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