Preliminary report on management of neonatal jaundice in maternity clinics of São Paulo city, Brazil

Estudo preliminar sobre a abordagem ao tratamento da icterícia neonatal em maternidades do município de São Paulo, Brasil

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ABSTRACT

Objective: The treatment of neonatal hyperbilirubinemia remains a problem because it can lead to sequelae in both children and adults. The objective of this study was to evaluate how neonatal jaundice is treated in maternity hospitals in the city of São Paulo. Methods: Prospective and transversal study on maternity hospitals in the city of São Paulo, Brazil. A questionnaire was applied to doctors working at neonatal wards within maternity hospitals in the city of São Paulo, divided into public (n = 6) and private maternity clinics (n = 18). The results obtained from the different items of the questionnaire were then compared. Statistical analysis was performed using the Student’s t test, chi-square test and Mann-Whitney test when appropriate, and a p value < 0.005 was considered significant. Results: There were no significant differences between the two types of maternity hospitals in relation to the treatment method for neonatal jaundice. However, among private maternities there were some that did not have written guidelines (5/17) and those that performed exchange transfusion (3/18). Teaching was significantly more present among public (100%) than private maternity hospitals (17.6%). The mean serum bilirubin levels to initiate treatment did not show significant differences between the two types of maternity hospitals. Some clinical practices in use by maternity hospitals are not evidence based. Conclusions: The present data were considered preliminary and showed that further research in the area is required and if our findings are confirmed, indicate the need for continuous medical education on the part of health professionals in charge of newborns.

Keywords: Jaundice, neonatal/therapy; Hospitals, maternity

INTRODUCTION

Jaundice is a very frequent clinical condition and also one of the most serious problems of the neonatal period. It may occur in both physiologic and pathologic processes in newborns(1,3).

Several mechanisms may be involved in the occurrence of neonatal physiologic jaundice, and may be related to the mother, the newborn, the environment, or even laboratory variations which could be interfering in the evaluation of the jaundiced infant(1,4-7).
The “disease” neonatal jaundice, on the other hand, is related to pathological processes present in the neonatal period, such as different types of hemolytic disorders, increased enterohepatic circulation, decreased hepatic uptake of bilirubin, or bilirubin conjugation.(5)

The main objective of the treatment of neonatal hyperbilirubinemia is to prevent bilirubin-induced neurologic dysfunction, including kernicterus in its acute and chronic forms, which are very serious.(6) There are different methods of treatment(3,5), each having specific indications: phototherapy, exchange transfusion or medication.

Despite being the most frequent condition in nursery(1,5,8), the management of jaundice treatment varies greatly among maternity wards, and sometimes even among professionals working within the same maternity unit.(9) National(3,8,9) and international(10-17) studies do not show a consensus with regard to the best treatment.

In 1994(18), the American Academy of Pediatrics (AAP) produced guidelines for the management of neonatal jaundice, which were updated in 2004(19). In spite of these guidelines, there is still no overall consensus among health institutions regarding their utilization. There is indeed a tendency nowadays among neonatologists to delay the use of phototherapy in healthy term newborns with non-hemolytic (physiologic) jaundice until serum bilirubin levels have reached values which are considerably higher than hitherto allowed. Such practices however, together with early hospital discharges, are responsible for the reemergence of kernicterus in the United States(20-22).

Gartner et al.(16), even before the 1994 AAP guidelines were published, using self-applied questionnaires with 600 pediatricians and 606 neonatologists in 1992, was able to ascertain that there was a wide range of procedures being followed by the two groups, and also that the pediatricians’ behavior was closer to the guidelines subsequently published by the AAP.

Hansen(17) states there is no agreement over the best point to intervene and how to intervene. There is no consensus regarding the best way to approach this problem so as to prevent impairment to the newborn and/or in unnecessary costs. The same author studied the procedures adopted in several countries on different continents (Europe, North America, Africa and Asia), hoping to glean a general idea of the clinical practices in use to manage neonatal hyperbilirubinemia.

Bhutani et al.(23) affirm that, for sick newborns, the absence of accurate data on the neurological damage caused by the toxicity of bilirubin, the lack of predictive indices, as well as of studies based on evidence, clearly show the need for establishing clinical strategies and guidelines to be adopted for infants.

To date, however, there is no consensus on the treatment of neonatal hyperbilirubinemia(20), especially with regard to term newborns without hemolysis.

The present study focused on this issue, examining maternity hospitals in the city of São Paulo.

**OBJECTIVE**

- To evaluate the management of neonatal hyperbilirubinemia within neonatal wards of maternity hospitals in the city of São Paulo.
- To identify differences among these maternity hospitals concerning the approach to treatment for neonatal hyperbilirubinemia.

**METHODS**

Type of study: prospective, transversal.

**Sample**

A questionnaire designed by Hansen in 1996(18) with open and closed questions validated in the original publication and translated by the authors was used.

The target population was constituted initially by 128 health institutions located in the city of São Paulo and registered under the Self-Regulating Medical Body as general or specialized hospitals, providing maternity services, including university hospitals, hospitals of the municipal public health service, and hospitals of the private sector.

The initial inclusion criteria was to involve all maternity hospitals located in São Paulo city and registered at the Regional Board of Medicine in an attempt to obtain the greatest number of possible units informing on the treatment of neonatal jaundice.

Exclusion criteria: maternity clinics where the head of the Neonatal Ward refused to participate; maternities which, despite having agreed to participate, obstructed interviewer access; questionnaires where less than 50% of the questions were answered. This last criterion was adopted by the researchers in order to avoid impairment of the results evaluation.

The final total of the sample included 24 maternity clinics.

**Procedures**

The questionnaire was applied by means of a personal interview conducted within the Neonatal Ward by a specially trained professional. Some pilot interviews were previously organized in order to train the interviewer and improve the approach to the medical professionals.
Only doctors were interviewed, preferably those in charge of the Neonatal Ward included in the study. When it was not possible to do so, a doctor recommended by the head of the neonatal ward was interviewed. In this first contact, a brief explanation about the study and its objectives was given.

At the time of interview, the doctor was prompted to outline how phototherapy was actually used in their daily routine. The interviewer carefully explained that there were no correct or incorrect answers, and that the objective of such questions was not to evaluate theoretical knowledge on the treatment of neonatal jaundice, but to understand how the available technology was being used in the treatment of neonatal jaundice.

Each unit answered one questionnaire. The maternity hospitals were also categorized as private maternities (PrM), n = 18, and public maternities (PbM), n = 6 practices, for the sake of comparison.

The following characteristics were observed:

- characterization of the neonatal ward;
- existence of written routines or protocols for the management of neonatal jaundice at the ward;
- methods for the treatment of neonatal jaundice available at the nursery/neonatal intensive care unit (NICU): phototherapy, exchange transfusion, pharmacological treatment;
- types of phototherapy equipment used at the nursery/NICU (conventional, halogen spotlights, fiberoptic blankets or bassinets);
- types of light sources (white, blue, green);
- way phototherapy was applied (continuously or intermittently);
- teaching practice, presence or absence;
- newborn care, such as additional fluid supplementation, eye and gonad shielding during phototherapy.

Questions regarding what serum bilirubin level was adopted as an indication to begin treatment with either phototherapy or exchange transfusion at different weight levels (from 500 g to over 3,500 g) were also included in the questionnaire.

Statistical analysis

Global descriptive analysis of the data; categorical variables (yes or no) were analyzed by the chi-square test; continuous variables were analyzed by the Student’s t test or Mann-Whitney test, when appropriate; variables among the different types of hospitals were interpreted by analysis of variance (for continuous variables) or contingency tables (for categorical variables).

The statistical analysis was performed by means of the BMDP Statistical Software, Los Angeles, CA, 1992. The statistical tests were two-tailed, and a p value < 0.05 was considered significant.

The data obtained were analyzed by the software Epi-info 6.04 (in the public domain) from the CDC of Atlanta.

This study was approved by the Institution’s Research Ethics Committee.

RESULTS

With regard to the existence of written routines, previously established by the health team for the indication of phototherapy and/or exchange transfusion, 18/24 (75%) of the maternities stated they had such written guidelines for the indication of type of treatment newborns were to receive.

In terms of conventional phototherapy equipment availability, all the maternity units claimed to have their own.

The capability to perform exchange transfusions was reported in 22/24 (91.7%) of maternity clinics. Two of them reported that they were unable to perform this procedure.

The use of medication in the treatment of neonatal jaundice was reported in 6/21 (28.6%) maternities, phenobarbital being the medication cited.

The following results were obtained in relation to specifications for use of phototherapy: ordinary white light (day light) was used in 17/23 (73.9%) of the neonatal wards where total response for the item was 75%. Ordinary blue light was used in 8/20 (40%) of the maternity wards where total answers for the item was 83.3%. None of the studied maternities mentioned the use of green light.

In relation to the type of phototherapy equipment used, bilibassinet was used in 11/21 (52.4%) of the maternities, where total of answers for the item was 87.5%; whilst halogen spotlights were used in all hospitals and fiberoptic blanket in 2/18 (11.1%) units, where the total of answers for these items was 75%.

The use of continuous phototherapy was reported in all the maternities and the use of prophylactic phototherapy in 16/23 (69.6%) of the maternity hospitals. This item was left unanswered in one case.

The occurrence of teaching practice was identified in 9/23 (39.1%) of the maternity units. This item was unanswered in one case.

When the maternities were categorized into private (PrM) or public (PbM) maternity hospitals, no statistical differences were found among the various items studied, except for the occurrence of teaching practices which showed a significant difference between the two types of hospital: among PrM, only 3/17 (17.6%) reported teaching practices, while among PbM this practice was present in 6/6 (100%), (χ² =
12.627 and \( p = 0.000 \). Total of answers for this item was 23 (95.8%). These data are shown in table 1.

Table 1. Comparison between PvM and PbM with regard to methods of treatment of neonatal jaundice

<table>
<thead>
<tr>
<th>Item</th>
<th>N (%)</th>
<th>N (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existence of written guidelines</td>
<td>12/17 (70.6)</td>
<td>6/6 (100.0)</td>
<td>0.184</td>
</tr>
<tr>
<td>Conventional phototherapy</td>
<td>18/18 (100.0)</td>
<td>6/6 (100.0)</td>
<td>–</td>
</tr>
<tr>
<td>Exchange transfusion</td>
<td>16/18 (88.9)</td>
<td>6/6 (100.0)</td>
<td>0.554</td>
</tr>
<tr>
<td>Use of medication</td>
<td>4/16 (25.0)</td>
<td>2/5 (40.0)</td>
<td>0.450</td>
</tr>
<tr>
<td>Ordinary white light</td>
<td>12/17 (70.6)</td>
<td>5/6 (83.3)</td>
<td>0.490</td>
</tr>
<tr>
<td>Ordinary blue light</td>
<td>6/16 (37.5)</td>
<td>2/4 (50.0)</td>
<td>0.535</td>
</tr>
<tr>
<td>Bilibassinet</td>
<td>8/16 (50.0)</td>
<td>3/5 (60.0)</td>
<td>0.550</td>
</tr>
<tr>
<td>Halogen spotlight</td>
<td>17/17 (100.0)</td>
<td>6/6 (100.0)</td>
<td>–</td>
</tr>
<tr>
<td>Fiberoptic blanket</td>
<td>2/15 (13.3)</td>
<td>3/3 (100.0)</td>
<td>0.686</td>
</tr>
<tr>
<td>Continuous phototherapy</td>
<td>17/17 (100.0)</td>
<td>6/6 (100.0)</td>
<td>–</td>
</tr>
<tr>
<td>Prophylactic phototherapy</td>
<td>13/17 (76.4)</td>
<td>3/6 (50.0)</td>
<td>0.239</td>
</tr>
<tr>
<td>Teaching practice</td>
<td>3/17 (17.6)</td>
<td>6/6 (100.0)</td>
<td>0.000*</td>
</tr>
</tbody>
</table>

* \( p = \) significant

Concerning newborn care, the following items were verified:

1. eye shields – all the maternities used these. Total of responses for the item: 23 (95.8%);
2. gonad shields were used in 12 (70.6%) of the PvM and in 3 (50%) of the PbM. The difference was not statistically significant (\( x^2 = 0.829 \) and \( p = 0.334 \)). Total of answers for the item: 23 (95.8%);
3. fluid supplementation (water + glucose) was used in 14 (82.4%) of the PvM and in 6 (100%) of the PbM. The difference was not statistically significant (\( x^2 = 1.218 \) and \( p = 0.384 \)). Total of answers for the item: 23 (95.8%);
4. newborn position changes during phototherapy – performed in 15 (93.8%) of the PvM and in 5 (100%) of the PbM. The difference was not statistically significant (\( x^2 = 0.328 \) and \( p = 0.762 \)). Total of answers for the item: 21 (87.5%).

Table 2 shows data on newborn care.

Table 2. Special care provided to the newborn

<table>
<thead>
<tr>
<th>Item</th>
<th>N (%)</th>
<th>N (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye shielding</td>
<td>17/17 (100.0)</td>
<td>6/6 (100.0)</td>
<td>–</td>
</tr>
<tr>
<td>Gonad shielding</td>
<td>12/17 (70.6)</td>
<td>3/6 (50.0)</td>
<td>0.334</td>
</tr>
<tr>
<td>Fluid supplementation</td>
<td>14/17 (83.4)</td>
<td>6/6 (100.0)</td>
<td>0.384</td>
</tr>
<tr>
<td>Change of newborn position</td>
<td>15/16 (93.8)</td>
<td>5/5 (100.0)</td>
<td>0.762</td>
</tr>
</tbody>
</table>

The serum levels of bilirubin deemed necessary to initiate treatment of jaundice, including both phototherapy and exchange transfusion, over several days (1 to 5) and across different weight categories studied (500 g to > 3,500 g), did not show significant differences between PvM and PbM. The statistical test applied to the quantitative analyses was the Mann-Whitney test, totaling 33. However, in the analysis of the bilirubin levels indicating the need for exchange transfusion, a single significant value was found for the 3rd day of life, for the weight category of 1,500 to 2,499 g (\( Z = 2.130 \) and \( p = 0.033 \)). Figures 1 to 4 show the comparison between mean values of serum bilirubin adopted at PvM and PbMs for the indication of phototherapy and exchange transfusion on the 1st, 2nd and 3rd day of life for 4 groups of newborns according to 4 levels of weight (500-1,499 g; 1,500-2,499 g; 2,500-3,499 g; ≥ 3,500 g).

Figure 1. Mean serum levels of indirect bilirubin (days 1, 2 and 3) for the indication of phototherapy and exchange transfusion in private and public maternity clinics. The differences were not statistically significant.

Figure 2. Mean serum levels of indirect bilirubin (days 1, 2 and 3) for the indication of phototherapy and exchange transfusion in private and public maternity clinics. The differences were not statistically significant, except for exchange transfusion on day 3.
DISCUSSION

The present study, due to the operational difficulties encountered in obtaining a large number of answered questionnaires, acquired a small final sample which represented less than 20% of the area to be theoretically researched. It should be emphasized that the answers to each single questionnaire pertained to one maternity unit, and were not related to the number of doctors. Thus, instead of being interpretable as a representative approach to the management of the treatment of neonatal jaundice at Neonatal Wards in the city of São Paulo, it serves merely as an example of a preliminary study, or a “snapshot” of a certain point which, nevertheless, could serve as a warning as well as an incentive for the running of further studies in this area. Considering the refusals to answer the researcher’s questionnaire or the hampering of access to information could be explained by (however, erroneously) the “auditory” nature of the investigation, the present study can still be viewed as a “red light” in spite of possible bias. Hansen’s study\(^{(17)}\), including neonatal wards in Europe, the United States, Africa and Asia, obtained a percentage of 49% of answered questionnaires.

Regarding the findings of the present study, a few maternity units stated the inexistence of written guidelines. The same occurred in the study by Hansen\(^{(17)}\) and Vieira et al.\(^{(3)}\). It is common knowledge that in health services where the doctors on duty work on a rota basis, whereby each professional may establish their own personal approach, the management of patients is invariably impaired\(^{(17)}\). As not all the doctors in the services were interviewed in the present study, it is possible that the routines reported by the doctor in charge may not represent those followed by all doctors, where assistance to the newborn may be poorer.

The existence of phototherapy was reported by all the maternities studied. Although the vast majority stated they were able to perform exchange transfusion, some claimed not to perform it. The fact that a health institution caring for newborns is incapable of performing an exchange transfusion represents, from a clinical point of view, a serious risk to the infants, who could then be affected by bilirubin-induced neurological dysfunction (BIND), with extremely severe consequences. In Hansen’s study\(^{(17)}\), of 108 answers, 2 stated they were unable to perform exchange transfusion.

The same author reported a wide variability in relation to the type of phototherapy used, the use of fluid supplementation, prophylactic phototherapy as well as differences in serum bilirubin level for initiating treatment, taking into account the newborn’s weight, and the deployment of phototherapy or exchange transfusion.

Vieira et al.\(^{(3)}\) revealed the same situation, although this study employed a different methodology, based on interviews with medical doctors and other health professionals.

The present study also identified this variability. Ordinary white lights (day light) were the most commonly used, with blue lights less commonly used. Halogen spotlights were used by all the maternity units, and less frequently, the bilibassinet. The fiberoptic blanket is rarely employed. None of the studied maternity clinics reported the use of special blue light, recommended by the AAP as the best kind of light for the treatment of neonatal jaundice\(^{(19)}\).

Even though there is no evidence in the literature that gonad shielding, use of phenobarbital, or changes in the infant’s position are beneficial to newborns\(^{(3,5,24)}\), these procedures were reported. Another procedure on which there is no evidence in the literature is that of
prophylactic phototherapy\(^{(3,19)}\), used in some maternity units.

There is no evidence that fluid supplementation affects serum bilirubin levels\(^{(19)}\). However, since the products of photodegradation of bilirubin are excreted through urine and bile, the maintenance of a suitable level of hydration is recommended in newborns submitted to phototherapy in order to provide good urinary output, increasing phototherapy effectiveness\(^{(19)}\). The best fluid to be given to the newborn is breast milk or a formula supplement, so as to inhibit enterohepatic circulation. The use of dextrose water is not recommended\(^{(19,25)}\) yet the present study revealed that the procedure of fluid supplementation to infants submitted to phototherapy using dextrose water was adopted in majority of the two types of maternities studied. These findings are in accordance with the Vieira et al.’s study\(^{(3)}\).

All the maternity units perform eye shielding and continuous phototherapy, concurring with the evidences in the literature\(^{(1,19,24,26)}\).

When the maternity units were categorized into private or public, a criterion adopted to compare institutions under study, the only statistically significant difference found between the two types of maternity hospitals studied concerned teaching practice, proving much more common within PbMs than PvMs, showing the PbMs’ vocation for teaching.

There were no statistically significant differences with regard to the analysis of the serum bilirubin levels for initiating phototherapy or exchange transfusion at different weight categories or days of life. The exception was with regard to the tests, which indicated that for a certain day of life and weight category, exchange transfusion would be performed at a lower serum bilirubin level in the PvMs than the PbMs. Nevertheless, given the number of tests applied (Mann-Whitney, 33 tests) and since only one of these showed a significant result, this was interpreted as anomalous.

The present study was designed with the aim of interviewing only those responsible for guidelines used in neonatal units and not all doctors working in these units. Therefore, the small number of answers may not be used as a universal parameter, but may serve to show the tip of an iceberg in relation to aspects that inevitably impair the appropriate kind of newborn care provided: even only one unit, irrespective of setting which is unable to perform exchange transfusion reveals a very serious failure and calls for measures to be taken to remedy the situation.

The data obtained in the present study indicate the need for further studies in this area and, should these preliminary data be confirmed, for programs of continuous education destined to all health professionals caring for newborns.

**CONCLUSIONS**

1. The present study, characterized as a preliminary study, verified the absence of written guidelines, as well as of exchange transfusion in some PvMs.
2. Although all the maternity units stated they owned phototherapy equipment, a wide variety of equipment and types of light sources were in use.
3. Some procedures not based on scientific evidence are still being adopted by several maternity units, both PvM and PbM.
4. Teaching practice was significantly more present at PbMs.
5. Serum bilirubin levels adopted for initiating phototherapy or exchange transfusion did not show statistically significant differences between the two types of maternity hospitals.

**REFERENCES**


