Breastfeeding-associated hypernatraemic dehydration

Desidratação hipernatrêmica associada ao aleitamento materno

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ABSTRACT

Objective: In the last few years there has been an increase in case reports of hypernatraemic dehydration in breastfed newborns. Insufficient intake has an important role in the pathophysiology of this condition. The aim of this study was to evaluate exclusively breastfed neonates admitted for hypernatraemic dehydration.

Methods: Retrospective study of breastfed neonates diagnosed with hypernatraemic dehydration, between March 2002 and March 2008, in a level 1 maternity. Results: Nineteen cases were identified (0.44% of neonatal intermediate care hospitalizations), 53% of them were male. The annual distribution revealed a higher number of cases in 2008: 26.3% in only three months. Median birth weight was 3,000 g and the median gestational age was 38 weeks. Vaginal delivery was the most frequent form of birth (42%), and 79% of mothers were primiparas. Admissions were made through the emergency department in 68.4%. The main reasons for seeking medical attention were: poor oral intake (32%), weight loss (26%), and jaundice (26%). The median age at admission was four days. Percentage of weight loss: 6.7 to 40%, median was 11%. Dehydration signs were absent in 42% of the patients. Median Na⁺ values were 152 mEq/l. Jaundice was the most frequent comorbidity found (74%). Intravenous fluids were administered in 89% and acute neurological complications were found in 21%, there were no deaths. Conclusions: Breastfeeding-associated hypernatraemic dehydration seems to be a consequence of breastfeeding difficulties in inexperienced mothers. Since many cases are paucisymptomatic, there should be a high level of suspicion, especially in those patients with jaundice.

Keywords: Dehydration; Hypernatremia; Infant, newborn; Breast feeding

RESUMO

Objetivo: Nos últimos anos verificou-se um aumento do número de casos descritos de desidratação hipernatrêmica em recém-nascidos em aleitamento materno exclusivo, sendo o déficit de aporte o desencadeante habitual. O objetivo deste estudo foi caracterizar a população de recém-nascidos com desidratação hipernatrêmica, associada ao aleitamento materno exclusivo numa maternidade de nível 1. Métodos: Estudo retrospectivo, entre Março de 2002 e Março de 2008, dos recém-nascidos internados por desidratação hipernatrêmica em aleitamento materno exclusivo. Resultados: Foram 19 casos (0,44% das internações), sendo que 53% eram do sexo masculino. A distribuição anual revelou um maior número de casos em 2008 (26,3%, em apenas três meses). O parto eutóxico foi o mais frequente (42%). A mediana de peso ao nascer foi de 3.000 g e a da idade gestacional, 38 semanas; 79% das mães eram primíparas, e 68,4% dos recém-nascidos foram admitidos pelo serviço de urgência, sendo os principais motivos de consulta: recusa alimentar (32%), perda ponderal (26%) e icterícia (26%). A mediana de idade à internação foi de quatro dias. A percentagem de peso perdido foi de 6,7 a 40% (mediana de 11 %) e 42% não apresentavam sinais de desidratação. A mediana dos valores de Na⁺ à admissão foi de 152 mEq/l. A comorbidade mais frequente (74%) foi icterícia. O tratamento foi prioritariamente intravenoso (89%). Complicações neurológicas agudas foram observadas em 21% e não houve óbitos. Conclusões: A desidratação hipernatrêmica associada ao aleitamento materno exclusivo surge como consequência de dificuldades na amamentação em mães inexperientes. Dado que muitos casos são oligossintomáticos, é necessário ter um elevado índice de suspeita desta alteração, especialmente nos que se apresentam com icterícia.

Descritores: Desidratação; Hipernatremia; Recém-nascido; Aleitamento materno
INTRODUCTION
Hypernatraemic dehydration is a potentially severe pathology, especially in newborns. Complications can occur due to hypernatraemia or its treatment, and include cerebral oedema, seizures, intraventricular haemorrhage, haemorrhagic infarct and permanent brain damage, disseminated intravascular coagulation, vascular thrombosis, renal failure, and eventually, death\(^\text{1-5}\).

In the last ten years, there has been an increase in case reports of exclusively breastfed neonates with hypernatraemic dehydration, which can be either a reflection of greater awareness of the medical community of this problem or a true rise in incidence.

Several studies have implied that insufficient intake associated with exclusive breastfeeding has an important role in the pathophysiology of this condition\(^6-10\). Although this matter has been amply discussed in international literature, there are no data acknowledging the magnitude and relevance of this entity in Portugal.

OBJECTIVE
The aim of this study was to evaluate breastfed neonates admitted to a level 1 maternity with hypernatraemic dehydration.

METHODS
A retrospective study was conducted through the review of clinical charts of breastfed neonates hospitalized for hypernatraemic dehydration at the Neonatal Intermediate Care Unit of a level 1 maternity in Portugal. The time period was six years, between March 2002 and March 2008.

 Besides clinical charts with the final diagnosis of dehydration and/or hypernatraemia, all readmissions for jaundice, hypoglycaemia, weight loss, poor oral intake, and fever were also reviewed.

Patients were enrolled in the study based on the following criteria: exclusively breastfed newborns under 28 days of life, with a gestational age greater than 35 weeks, significant weight loss (defined as > 5% in 24 hours or > 7% after the first week), and hypernatraemia (Na\(^+\) > 145 mEq/l). Neonates with suckling disorders and infection or organic pathology were excluded.

Data collected included month and year of occurrence, gender, gestational age and birth weight, delivery method, maternal age and number of prior gestations, provenience and reasons for seeking medical assistance, age at admission, percentage of weight loss, dehydration signs, laboratory values (sodium, glucose, and urea) at admission, comorbidities, treatment, acute neurological complications, and deaths. The software Microsoft Office Excel 2003 was used for descriptive analysis of the data.

RESULTS
From 110 patient medical charts reviewed, a total of 19 cases that satisfied the inclusion criteria were identified, which accounted for 0.44% of hospitalizations in the Neonatal Intermediate Care Unit during that period.

The annual distribution revealed a higher number of cases in 2008, with five cases in only three months (Figure 1). The monthly distribution showed that the majority of cases occurred during the cold months, from October to March.

Birth weight ranged from 2,370 to 4,145 g, with a mean of 3,163 g (± 4,30.2 g), median of 3,000 g and gestational age from 35 weeks plus three days to 40 weeks plus six days, mean of 38 weeks plus four days (± 9.6 days); median of 38 weeks plus five days. Fifty-three percent of the patients were male. Vaginal delivery was the most frequent method of birth (42%), and 16% were caesarean sections.

Maternal age varied between 16 and 38 years (mean of 28 years ± 5.4 years; median of 30 years); 79% of mothers were primiparas; for 5% it was the second child, and for 16%, the third.

In most of the cases, admission was made through the emergency department (68%, n = 13). Four neonates were transferred from the maternity ward at a very low age, one was admitted through the outpatient clinic and another was transferred from another hospital.

The most frequent reasons for seeking medical attention were poor oral intake (32%, n = 6), weight
loss (26%, n = 5), and jaundice (26%, n = 5). Another important reason was newborn irritability with constant crying, referred in four cases (21%), as seen in Figure 2.

Regarding laboratory values at admission: natraemia values ranged from 146 to 196 mEq/l, with mean of 154.6 mEq/l (± 11.2 mEq/l) and median of 152 mEq/l. While 47.4% of neonates presented with only slight hypernatraemia (Na⁺ ≤ 150 mEq/l), three of them had natraemia values > 160 mEq/l (15.8%). Glucose and urea values were also analysed (Table 1).

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>Median</th>
<th>% patient/Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na⁺ (mEq/l)</td>
<td>19</td>
<td>146</td>
<td>196</td>
<td>154.6 ± 11.2</td>
<td>152</td>
<td>47.4% &lt; 150, 15.8% &gt; 160</td>
</tr>
<tr>
<td>Glucose (mg/dl)</td>
<td>15</td>
<td>30</td>
<td>107</td>
<td>65.6 ± 18.6</td>
<td>64</td>
<td>20% &lt; 50</td>
</tr>
<tr>
<td>Urea (mg/dl)</td>
<td>15</td>
<td>18</td>
<td>291</td>
<td>63.9</td>
<td>37</td>
<td>80% &lt; 40, 34% &gt; 70</td>
</tr>
</tbody>
</table>

Na⁺: sodium; Min.: minimum; Max.: maximum.

Comorbidities were identified in 74% (n = 14), and all of the patients had jaundice due to indirect hyperbilirubinemia, the most frequent comorbidity. Other comorbidities found were hypoglycaemia (n = 3, 21%) and acute kidney injury (n = 1, 7%). Treatment was intravenous except for two cases, the ones with the mildest dehydration.

Acute neurological complications were found in 21% (n = 4): two cases of seizures (10.5%), one cerebral infarct (5.2%), and one grade III intraventricular haemorrhage (5.2%). Brain ultrasound was performed in about half of the neonates (n = 10, 53%), showing no abnormality in 80%.

**DISCUSSION**

Due to its important role in optimizing growth and development, exclusive breastfeeding is the best source of nourishment during the first months of life\(^{(1)}\). Benefits for both mother and infant are multiple, so breastfeeding must be stimulated and promoted.

Nevertheless, breastfeeding failure, whether due to hypogalactia, insufficient feedings, or inadequate breastfeeding techniques, can have severe consequences such as hypernatraemic dehydration in neonates\(^{(2)}\).

In this study, the percentage of primiparous mothers was very high (80%), as is described in medical literature, which supports the idea that inexperience is a key factor in breastfeeding failure\(^{(1)}\).

The low percentage of caesarean sections verified, opposed to the usual 30% in this maternity, may reflect the influence of premature patient discharges in limiting opportunities for contact with healthcare professionals, and therefore, fewer possibilities for teaching and supervision of breastfeeding techniques.

Most cases occurred during the cold months of the year. Given the retrospective nature of this study, it was...
not possible to assess why, but other published series with similar results have identified overheating and the consequent increase of unperceived water loss as a risk factor\(^3\).

In this series, the median age at admission was much lower than the classically described of ten days of life. These data, together with the significant percentage of hospitalizations from the maternity ward (21%), underline the urgent need for better support, with closer supervision and better instruction as to breastfeeding techniques.

Considering weight loss, it is important to remember that according to recent recommendations of the American Academy of Paediatrics, a weight loss greater than 7% during the first week of life should constitute an alert signal to the possibility that breastfeeding is insufficient. In these cases, clinical status and, more specifically, breastfeeding techniques, must be evaluated\(^4\).

Other alert signals to watch for are a continuing weight loss beyond the first week of life and inability to achieve birth weight by the tenth day of life\(^5\).

In order to prevent this situation, as recommended by the American Academy of Paediatrics, all breastfed newborns should be daily weighed and clinically assessed until three to five days of life\(^6\), with assessment and direct observation of breastfeeding techniques by specialized healthcare professionals\(^6\).

Over 40% of newborns presented no signs of dehydration, which is a contributing factor in masking this situation and making diagnosis more difficult. In hypernatraemic dehydration, as opposed hypo- and isonatraemia, extracellular volume is much better preserved than the intracellular one, and as such, dehydration signs are much less pronounced.

On the other hand, weight loss and decreased frequency of urination and bowel movements are sensitive indicators of dehydration in breastfed neonates that should always be sought when assessing a newborn with signs of fever, weight loss, jaundice and/or lethargy\(^7\).

Another point to consider is the fact that indirect hyperbilirubinemia is such a common comorbidity that some authors advise that weight and natremia assessment should be part of the practice guidelines for the management of hyperbilirubinemia\(^7\).

These factors are of extreme importance, as even those cases of hypernatraemia that resolve without being identified and adequately treated may result in some degree of neurological damage, which can become apparent years later\(^8\).

Acute neurological complications were found in 21%. Values described in literature vary from series to series, as they depend not only on the underlying clinical situation, but also on how the treatment is conducted\(^9\).

Rehydration should be performed slowly, with frequent monitoring of sodium levels, adjusting rhythm and/or IV serum composition so that the decrease of sodium levels does not surpass 0.6 mEq/l/hour. If correction is made too quickly, osmotic changes can heighten the risk for cerebral oedema and contribute towards permanent brain damage\(^9\).

In light of the data presented, the following question emerges: Is the incidence actually rising\(^{9,11-14}\)? To fully understand this question, the next points should be taken into consideration. First, the true incidence seems to be highly underestimated. Breastfeeding-associated hypernatraemic dehydration is underdiagnosed, since many patients are paucisymptomatic and in many cases, such as those presenting with hyperbilirubinemia, a high level of suspicion is warranted. Besides, the true incidence in this maternity cannot be calculated for we cannot exclude the possibility of recurrences (referred) to other medical institutions. It should be pointed out that a selection bias could have occurred, because this pathology is not always contemplated in the final diagnosis. On the other hand, the increasing lack of knowledge of mothers on breastfeeding and the growing lack of availability of healthcare professionals, with reduced doctor/patient and nurse/patient ratios, together with premature maternity patient discharges, are factors that can contribute to an actual rise in incidence.

As breastfeeding-associated hypernatraemic dehydration should be completely preventable\(^7\), it is essential that a group of measures should be established to counteract this tendency\(^11\).

Breastfeeding-associated hypernatraemic dehydration seems to be a consequence of breastfeeding difficulties in inexperienced mothers. This highlights the need for greater support from healthcare professionals in education and follow-up monitoring of breastfeeding techniques. Some intervention strategies should be implemented, such as: improvement in the education of pregnant women and new mothers on breastfeeding, this fact can be achieved either during prenatal appointments or during courses of preparation for delivery or puericulture. There should be a nursing staff specialized in lactation, similar to what happens in other countries, and there could also be brochures given to new mothers when leaving the maternity, with advice on breastfeeding and the warning signs of inadequacy of breastfeeding and dehydration\(^15\).

Weight assessment before discharge, which could lead to identification of newborns potentially at risk\(^16\), continuous training of healthcare professionals in order to undermine certain fundamentalist
concepts, regarding breastfeeding and to increase the level of suspicion as to this pathology, especially in those patients presenting with hyperbilirubinemia; development of better communication with Primary Healthcare Centres, to alert family doctors to this pathology and to promote early weight and clinical status assessment, as is proposed in the National Child Healthcare Surveillance Program.

CONCLUSION
The adoption of intervention strategies would allow not only the prevention, but also the identification of situations that point to hypernatraemic dehydration as early as possible, so that breastfeeding will always be in the baby’s best interest.

REFERENCES