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CLINICAL CASE REPORTS

Hypernatraemic Dehydration in a Newborn

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ABSTRACT

Introduction: The World Health Organization recommends initiating breastfeeding within the first hour of birth and exclusively breastfeeding for the first six months. This practice reduces the risk of infant illnesses such as diarrhoea and pneumonia and benefits mothers by lowering the risk of postpartum haemorrhage and certain cancers. Successful breastfeeding depends on factors like milk production, effective infant latch, maternal mental health, and support systems. Difficulties with breastfeeding can lead to serious neonatal complications, including hypernatraemic dehydration, defined as a serum sodium level above 145 mEq/L.

Case Report: We present a case of a 10-day-old male neonate, born at term by caesarean section after an uneventful pregnancy except for third trimester oligohydramnios. Despite initial breastfeeding attempts, the infant developed significant weight loss, reduced bowel movements, and decreased urine output by the tenth day of life. Upon admission, he had lost 26% of his birth weight, appeared cachectic, and exhibited signs of severe dehydration. Laboratory tests confirmed hypernatraemia (serum sodium concentration of 156 mEq/L). Immediate treatment with formula feeding and intravenous fluids resulted in normalization of serum sodium levels within 18 hours, and the infant regained his birth weight by day 17 of life.

Discussion: Hypernatraemia in neonates, particularly when related to breastfeeding difficulties, is a critical condition that can cause severe neurological and systemic complications. The rising incidence of hypernatraemia associated with exclusive breastfeeding underscores the need for adequate lactation support and close monitoring. Early hospital discharge without proper breastfeeding counselling significantly increases this risk.

Conclusion: While breastfeeding promotion is vital for public health, ensuring adequate support and monitoring is essential to prevent complications such as hypernatraemic dehydration. Close follow-up, regular weight monitoring, and access to professional lactation support are crucial for safeguarding the health of both infants and mothers.

Keywords: breastfeeding; hypernatraemic dehydration; infant health; lactation support; neonate

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KEYPOINTS

What is known:

- Early initiation and exclusive breastfeeding provide significant health benefits for infants and mothers.
- Hypernatraemic dehydration in neonates can result from inadequate breastfeeding, leading to serious complications such as cerebral edema and intracranial haemorrhage.
- Early discharge without proper breastfeeding counselling increases the risk of neonatal dehydration.

What is added:

- Early recognition and management of hypernatraemic dehydration should include prompt intervention with formula feeding and appropriate rehydration.
- Newborns should be weighted preferably before hospital discharge.
- Breastfeeding-related complications can be prevented with comprehensive lactation support and close monitoring of this process evolution.

INTRODUCTION

Breastfeeding is universally recognized as the optimal source of nutrition for infants, providing essential nutrients and antibodies that protect against a range of infectious and chronic diseases. The World Health Organization recommends initiating breastfeeding within the first hour after birth and maintaining exclusive breastfeeding for the first six months of life.[1] This practice is associated with a lower incidence of diarrhoea, pneumonia, allergic diseases, obesity, and diabetes in infants.[2] Mothers also benefit, as breastfeeding reduces the risk of postpartum haemorrhage in the short term and lowers the long-term risk of ovarian and breast cancers.[3]

Despite these well-established benefits, successful breastfeeding relies on several interdependent factors, including adequate milk production, effective milk transfer, and efficient milk extraction by the infant.[4] These are strongly influenced by maternal mental health and the quality of support received, from both healthcare professionals and the family environment.[4] The early postpartum period is particularly challenging, especially for first-time mothers or those with limited or no previous breastfeeding experience. Additional barriers such as postpartum pain, caesarean section, poor latch or positioning, and maternal anxiety can further compromise breastfeeding success.[4] Evidence shows that all forms of breastfeeding support—whether professional or informal, delivered in person or remotely—improve both the duration and success of breastfeeding.[5]

In healthy term neonates, weight loss of up to 10% in the first week of life is generally considered physiological, primarily as a result of normal postnatal diuresis. By the tenth day, infants are expected to regain their birth weight. However, rapid weight loss or a loss exceeding 10% should prompt further investigation.[6] One of the earliest and most sensitive indicators of neonatal hypernatraemic dehydration (HD) is weight loss greater than 7% of birth weight, often accompanied by reduced bowel movements and decreased stool output or the presence of urate crystals.[7]

If unrecognized or inadequately managed breastfeeding difficulties, can lead to excessive weight loss and serious complications such as HD.[8] Hypernatraemia, defined as a serum sodium concentration above 145 mEq/L, is a potentially life-threatening condition.[9] Delayed recognition and management can result in increased mortality and severe central nervous system complications, including seizures, thrombosis, and intracranial haemorrhage, as well as extracranial complications such as metabolic disturbances and acute kidney injury.[10]

This article discusses a clinical case that highlights the critical importance of early recognition, close monitoring, and comprehensive support for breastfeeding, aiming to prevent severe outcomes such as hypernatraemic dehydration in newborns.

CASE REPORT

We present the case of a ten-day-old male infant, born at 40 weeks of gestation via caesarean section, following a third trimester oligohydramnios. The mother, a 32-year-old primigravida, delivered a healthy newborn with a birth weight of 3300g, appropriate for gestational age. The infant was discharged home at 48 hours of life. Notably, no weight assessment was performed prior to discharge.

On day three of life, the infant was evaluated in the emergency department for latch difficulties. After a supervised feed was deemed successful, he was discharged without a weight check. The following day, a home visit by the family nurse included metabolic and endocrine screening, but again, no weight measurement was recorded.

At ten days of age, during his first scheduled health visit, the family doctor noted failure to thrive, absence of bowel

movements for six days, and decreased urine output with the presence of urate crystals. The mother reported exclusive breastfeeding, with approximately 12 feeds per day, apparent infant satisfaction, and no episodes of vomiting or diarrhoea.

Upon admission to the emergency department, the infant weighed 2400 g, representing a 26% weight loss from birth weight. He appeared malnourished, with a shrill cry, positive suck reflex, and a depressed anterior fontanelle. There were no signs of fever, respiratory distress, or jaundice. Venous blood gas analysis showed a pH of 7.313, bicarbonate 18.4 mEq/L, and lactate 3.2 mEq/L. Blood tests revealed hypoglycaemia (glucose 43 mg/dL), urea 80.1 mg/dL, creatinine 0.39 mg/dL, sodium 156 mEq/L, potassium 5.4 mEq/L, lactate dehydrogenase 447 U/L, and creatine kinase 95 U/L. The leucocyte count was 6,360/uL, haemoglobin was 19 g/dL, and platelet count was 138,000/uL. Urinalysis showed a specific gravity of 1.030 and numerous urate crystals. These findings supported the diagnosis of hypernatraemic dehydration secondary to decreased fluid intake in the context of ineffective breastfeeding. Initial management included formula feeding, which was well tolerated, together with intravenous rehydration using glucose-saline solution with sodium adjustment according to serum sodium levels and estimated free water deficit, in order to avoid overly rapid correction. Serum sodium decreased from 156 to 143 mEq/L within 18 hours, with progressive normalization of urine output. Intravenous fluids were discontinued on day four. Brain ultrasound was normal. The infant maintained good oral tolerance throughout hospitalization, regained his birth weight by day 17 of life, and was discharged after seven days with referral for high-risk follow-up to monitor for possible neurological sequelae.

DISCUSSION

Hypernatraemia is a significant cause of morbidity and mortality in neonates, leading to severe cerebral complications such as seizures, cerebral oedema, intracranial haemorrhage, cerebral venous sinus thrombosis, osmotic demyelination syndrome, permanent neurological damage, and death.[11] When associated with lactation failure, hypernatraemia typically presents between days 3 and 21 of life and can be challenging to detect, especially in infants who are unusually quiet or lethargic.[12]

In recent years, the incidence of neonatal hypernatraemia has increased, particularly in association with exclusive breastfeeding.[13] This contrasts with previous decades, when the primary cause was improper preparation of infant formula. One of the main contributors for hypernatraemia is inadequate fluid intake. Since milk is composed of approximately 87% water, feeding neonates every two to three hours is essential to reduce the risk of dehydration.[14] Factors such as delayed initiation of breastfeeding, infrequent feeds, problems with milk production, and ineffective milk extraction due to poor latch can all adversely affect total milk intake.[15] Early hospital discharge without adequate breastfeeding counselling is a recognized risk factor for neonatal hypernatraemic dehydration.[16]

To address breastfeeding challenges and improve outcomes, especially in the first month of life, it is crucial for mothers and infants to have close follow-up with regular weight monitoring ideally at discharge, and in the first week of life. Infants who lose more than 7% of their birth weight should undergo regular weight monitoring until weight gain is established. In this case, weighing at the day three ED visit or day four nurse visit would have detected a significant weight loss, enabling earlier intervention. The absence of weight assessment during these contacts represents a critical failure in postnatal care.

Mothers should always have access to professional support and should have positive reinforcement from family members.[5] Timely correction of lactation issues such as positioning, latch, and feeding frequency are important and may prevent newborn dehydration.[5] In this case, it appears that the parents confused true satiety with dehydration lethargy. This infant's apparently 'satisfied' behaviour likely reflected lethargy secondary to dehydration, evidenced by cachexia and reduced urine output. Parental education should emphasize signs of hunger (not just frequency) and screen for lethargy cues.

In the present case, the link between breastfeeding failure and hypernatraemic dehydration is evident. He was not weighed again until day ten, and during this period, the mother did not receive any professional breastfeeding support.

The differential diagnosis in this newborn included inadequate breastfeeding with insufficient milk transfer or maternal milk supply, which was the most likely explanation given the early latch difficulties, marked weight loss, absence of vomiting or diarrhoea, and reduced urine output. Other possibilities included metabolic or endocrine disorders, such as inborn errors of metabolism or congenital hypothyroidism, although these were less likely in the absence of other systemic manifestations. Late-onset infection, including sepsis or urinary tract infection, was also considered, but the absence of fever, respiratory distress, or other signs of systemic illness made this diagnosis less probable. Overall, the clinical picture and laboratory findings were most consistent with hypernatraemic dehydration secondary to inadequate intake related to breastfeeding difficulties.

In addition to hypernatraemia, the biochemical profile revealed lactic acidosis, hypoglycaemia and pre-renal azotaemia, all reflecting severe hypovolemia and poor tissue perfusion. Lactic acidosis in this setting likely results from impaired tissue oxygenation due to reduced effective circulating volume, while hypoglycaemia reflects depleted hepatic glycogen stores and inadequate caloric intake during prolonged fasting. Pre-renal azotaemia, as shown by elevated urea with a normal serum creatinine ~~ratio~~, further supports dehydration-induced renal hypoperfusion. These findings

underscore the systemic impact of breastfeeding-associated dehydration, which can quickly progress to multi-organ dysfunction if not promptly recognized and corrected.

Exclusively breastfed neonates may show transient serum sodium elevations between 145 and 149 mEq/L, but values above 150 mEq/L usually require active intervention. When sodium levels are between 146 and 149 mEq/L, close monitoring of weight and feeding effectiveness every 12 to 24 hours is recommended. For levels between 150 and 159 mEq/L, enteral rehydration with measured breast milk or formula should be initiated while maintaining breastfeeding whenever feasible. When sodium exceeds 160 mEq/L, intravenous rehydration is generally recommended because of the higher risk of morbidity and mortality [8].

Correction of hypernatraemic dehydration should be performed gradually to avoid cerebral overhydration. The recommended rate of correction should limit sodium reduction to ≤0.5 mmol/L/hour or 10–12 mmol/L/day, typically over two to four days, with close monitoring of sodium levels (17). In this case, the free water deficit and sodium excess were managed with gradual correction over 72–96 hours, although normalization of sodium was achieved within 18 hours after starting rehydration therapy.

While breastfeeding promotion remains a vital public health strategy to improve maternal and infant health, it must be accompanied by adequate support and monitoring to prevent dehydration and other complications associated with breastfeeding difficulties.

AUTHORSHIP

Joana Ventura Lourenço - Conceptualization; Methodology; Investigation; Data curation; Formal analysis; Visualization; Writing – original draft; Project administration

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