Original article:

Severe neonatal hypernatraemia: a population based study in Indian population

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Abstract:

BACKGROUND: Our aim was to describe incidence and short term outcomes of severe neonatal hypernatraemia (SNH, sodium ≥160 mmol/l).

METHODS: This was a retrospective, population based surveillance observational study over 12 months duration . Cases were >33 weeks gestation at birth, fed breast or formula milk and <28 days of age at presentation selected on basis attending OPD with number of cases as 60.

RESULTS: Of 60 cases of reported 28 mothers had intended to achieve exclusive breast feeding. Infants presented at median day 6 (range 2-17) with median weight loss of 19.5% (range 8.9-30.9). 12 had jaundice and 48 weight loss as a presenting feature. 42 presented with weight loss ≥15%.

CONCLUSIONS: Neonatal hypernatraemia is strongly associated with weight loss. It occurs almost exclusively after attempts to initiate breast feeding, occurs uncommonly and does not appear to be associated with serious short term morbidities, beyond admission to hospital.

BACKGROUND:

Water loss in excess of sodium intake is most commonly caused by diarrhea, vomiting, or high fever. It may also be caused by poor feeding in the early days of life (eg, when mother and infant are both learning to breastfeed) and may occur in very low-birth-weight (VLBW) infants born at 24 to 28 wk. In VLBW infants, insensible water losses through an immature, water-permeable stratum corneum combine with immature renal function and a reduced ability to produce concentrated urine to facilitate free water loss. Insensible water loss through the skin is also significantly increased by radiant warmers and phototherapy lights; exposed VLBW infants may require up to 250 mL/kg/day of water IV in the first few days, after which the stratum corneum develops and insensible water loss decreases. A rare cause is central or nephrogenic diabetes insipidus. Infants with hypernatremia and dehydration are often more dehydrated than is apparent by physical examination, because the increased osmolality helps maintain the extracellular fluid space (and hence circulating blood volume).[1]

Prevention of hypernatremia requires attention to the volume and composition of unusual fluid losses and of solutions used to maintain homeostasis. In neonates and young infants, who are unable to signal thirst effectively and to replace losses voluntarily, the risk of dehydration is greatest. The composition of feedings whenever mixing is involved (eg, some infant formulas and concentrated preparations for tube feeding) requires particular attention, especially

when the potential for developing dehydration is high, such as during episodes of diarrhea, poor fluid intake, vomiting, or high fever.[2]

Our aim was to describe incidence and short term outcomes of severe neonatal hypernatraemia (SNH, sodium ≥160 mmol/l).

METHODS:

This was a retrospective, population based surveillance observational study over 12 months duration . Cases were >33 weeks gestation at birth, fed breast or formula milk and <28 days of age at presentation selected on basis attending OPD with number of cases 60.

The written consent was obtained from parents for data collection purpose. The cases which were already admitted with similar features were excluded from present study. The detail clinical examination and investigations were done.

RESULTS:

Of 60 cases of reported 28 mothers had intended to achieve exclusive breast feeding. Infants presented at median day 6 (range 2-17) with median weight loss of 19.5% (range 8.9-30.9). 12 had jaundice and 48 weight loss as a presenting feature. 42 presented with weight loss ≥15%.

DISCUSSION:

Hypernatremic dehydration is not common in the neonatal period. The causes of hypernatremia can be due to excessive sodium intake or water deficit in excess of sodium deficit(1). One of the causes of excessive sodium intake in the neonatal period is excessive use of sodium bi-carbonate. Improper preparation of formula feeds and ORS can cause hypernatremia. This baby was on exclusive breast feeds and did not receive bicarbonate prior to admission. Increased insensible water loss especially in premature neonates kept under the radiant warmer can cause hypernatermic dehydra-tion. Central diabetes inspidus (DI) is rare in the neonatal period but can occur secondary to asphyxial injury. There was no history of asphyxia in this child. Nephrogenic diabetes insipidus is rare and can be primary or secondary to renal disease. Nephrogenic and central diabetes insipidus were ruled out in this child by the dehydration and vasopressin test.

There have been reports of hypernatremic dehydration occuring due to inadequate breast feeding(2-6). This can occur because of a combination of poor caloric and fluid intake. Some authors have reported a high sodium content in breast milk(2,4,7) and postulate that hypernatremia can occur because of this. Livingstone *et al*. have reported 21 neonates with hypernatremic dehydration–all attributable to lactation failure(2). In their study the breast milk sodium content had varied from 11 mmol/liter to 80 mmol/liter and was found to be elevated in 8 of 13 milk samples tested. We could not determine the sodium content in this mother's milk. There have been other reports of hypernatremic dehydration occuring in breastfed neonates and in one report it was fatal(4). In all the previously reported cases the mother have been elderly promigravida who were keen on breastfeeding. In the current report, the mother was a 38-year-old primigravida keen on feeding the baby. In the previous reports the neonates have been dehydrated with diminished urine output. In our patient, urine output was good despite the presence of dehydration. The good urine output in the presence of hypernatremic dehydration made us investigate for diabetes insipidus. Adequacy of breastfeeding has been based on urine output of atleast 6 times per day. This should not be the only criteria–hydration status

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and weight should also be evaluated in breastfed neonates.

The principles of management of hyper-natremic dehydration are as follows(1). The underlying cause should be identified and treated. If the baby is in shock it should be corrected with ringer lactate or normal saline challenge. The aim of therapy is to reduce serum sodium by 10-15 mEq/liter/day. The rate of correction is important and hypotonic solution should be avoided as it can cause cerebral edema. Initial fluids should have sodium concentration of 75 mEq/liter. Fluid deficit is calculated based on severity of dehydration or per cent weight loss - 2 to 3% more can be added to the assessed dehydra-tion. Deficit and maintenance requirement for 48 hours should be calculated and this volume should be administered over 48 hours. Ongoing fluid losses should be taken into account while calculating the fluid. The sodium need for 48 hours is 80-100 meq/liter of estimated fluid deficit. Maintenance sodium requirement need not be added to this. Hyperglycemia and hypocalcemia can occur and should be treated. Convulsion in a neonate with hypernatremic dehydration could be due to rapid drop in sodium levels and should be treated with 3% saline.

CONCLUSIONS:

Neonatal hypernatraemia is strongly associated with weight loss. It occurs almost exclusively after attempts to initiate breast feeding, occurs uncommonly and does not appear to be associated with serious short term morbidities, beyond admission to hospital.

References:

1. Conley SB. Hypernatremia. Pediatr Clin North Am 1990; 37: 365-372.

2. Living Stone VH, Willis CE, Abdel-Warethg LO, Thiossen P, Lockitch G. Neonatal hyper-natremic dehydration associated with breast feeding malnutrition: A retrospective survey. Can Med Assoc J 2000; 162: 647-652.

3. Cooper WO, Athertin HD, Kahans M, Kotagal UR. Increased incidence of severe breast-feeding malnutrition and hypernatremia in a metropolitan area. Pediatrics 1995; 96: 957-960.

4. Kaplan JA, Siegler RW, Schmunk GA. Fatal hypernatremic dehydration in exclusively breastfed newborn infants due to maternal lactation failure. Am J Forensic Med Pathol 1998; 19: 19-22.

5. Roddey OF, Martin ES, Swetenburg RL Critical weight loss and malnutrition in breast-fed infants. Am J Dis Child 1981; 135: 597-599.

6. Rowland TW, Zori RT, Lkafleur WR, Reiter EO. Malnutrition and hypernatremic dehydra-tion in breastfed infants JAMA 1982; 247: 1016-1017.

7. Anand SK, Sandburg C, Robinson RG, Liberman E. Neonatal hypernatremia asso-ciated with elevated sodium concentration of breast milk. J Pediatr 1980; 96: 66-68.