Clinical Profile of Neonates with Hypernatremic Dehydration in an Outborn Neonatal Intensive Care Unit

This hospital-record review describes the clinical profile of hypernatremic dehydration in neonates. 49 neonates (3.4% of the total admitted newborns) developed hypernatremic dehydration between January 2014 and August 2015. The major presenting complaints were fever (34.6%), poor feeding (42.8%), loose stools (40.8%) and lethargy (26.5%). The mean (SD) time needed for correction of hypernatremia was 38.6 (15.1) hours. Exclusively breastfed neonates had lesser complication rates of hypernatremic dehydration.

Keywords: *Breastfeeding, Dehydration, Neonatal, Sepsis*.

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Hypernatremic dehydration is a common but life threatening condition in neonates. Inadequate breastfeeding, improperly diluted mixed feeding, and gastrointestinal losses are the main etiologies for hypernatremia in neonates. Hypernatremia may cause intracerebral edema, hemorrhage, and gangrene, resulting in death or long-term morbidity [1,2]. Data on management and outcome of hypernatremic dehydration from developing world is limited. There is no universally accepted fluid regimen for management of hypernatremic dehydration [3].

Between January 2014 to August 2015, 1510 neonates were admitted in the out born neonatal intensive care unit of our hospital. Chart review of neonates with moderate and severe hypernatremic dehydration (serum sodium >150 meq/L) was done. Neonates with documented hypernatremia and presenting without any prior treatment were included; those with proven sepsis were excluded. Hypernatremia was corrected using formula based on water deficit and solute deficit [4].

Forty-nine neonates were admitted with hypernatemic dehydration. The presenting complaints were fever (34.6%), poor feeding (42.8%), loose stools (40.8%), lethargy (26.5%), decreased urine output (8.2%), and weight loss (75.5%); 24.5% neonates presented with neurological complaints and examination revealed a doughy feel of skin in 90 % of the neonates. Thirty-three (67.3%) neonates were hospital-delivered and 6 (12.2%) had history of birth asphyxia. Seven neonates (14.8%) required ionotropes and five had culture positive sepsis. The mean (SD) time needed for correction of hypernatremia was 38.6 (15.1) hours. Mean (SD) percentage of dehydration on presentation was 16.3 (11.03). Mean (SD) sodium on admission was 157.7 (9.41) mEq/L. Hyperkalemia and metabolic acidosis was present in 21 (42.8%) and 39 (79.6%) neonates, respectively. The mean (SD) duration of hospital stay was 7.1 (4.8) days. Clinical and laboratory characteristics of neonates with hypernatremia compared to feeding status is shown in ***Table* I**. Exclusively top fed neonates had higher percentage of acute kidney injury, mean sodium level, mean creatinine value at presentation and were more dehydrated compared to other groups.

Oddie, *et al*. [4] have reported an incidence of hypernatremic dehydration as 2.5/10000 live births and Moritz, *et al*. [5] found a 5-year incidence of breastfeeding associated hypernatremia among hospitalized neonate to be 1.9%. The mean (SD) age of presentation was 14.8 (8.3) days, which is comparable to previous studies (4-21 days). We found 61.2% neonates with >10% weight loss, which is comparable to study by Uras, *et al*. [5].

We did not find caesarian section (18.3%) to be a risk factor for hypernatremic dehydration as has been reported in previous studies [6,7]. A large number of home deliveries in the study population may account for this difference. Our study confirmed more cases of hypernatremic dehydration in primigravida mothers (46.9%) as previously also reported [8].

The mean (SD) time taken to correct hypernatremia was 38.6 (15.1) hours. Faith, *et al*. [9] found a fall in mean (SD) sodium levels of 0.48 (0.2) mEq/L in first 24 hours [9]. At the time of discharge, neurological examination was normal in 85.7% neonates.

Limitations of present study include its retrospective design, lack of neurodevelopment follow-up, lack of correlation between breast milk sodium levels and hypernatremia, and not recording correction rate in serum sodium levels in first 6 and 24 hours.

Poor feeding is both a cause and a manifestation of hypernatremic dehydration. Exclusively breastfed neonates with hypernatremic dehydration have fewer complications. Fluid management is cornerstone of good outcome in hypernatremic dehydration and such cases

TABLE I CLINICAL AND LABORATORY CHARACTERISTICS IN NEONATES WITH HYPERNATREMIC DEHYDRATION (*N*=49)

Parameter	*Exclusively breastfed (n=16)*	*Exclusively top fed (n=17)*	*Mixed fed (n=16)*
*Acute kidney injury	11 (68.7%)	14 (82.3%)	8 (50%)
Serum Sodium (meq/L)	150 (148-159)	164.5 (145-165)	158 (149-163)
Serum Potassium (meq/L)	5.3 (4-6)	4.9 (4-5.9)	6.9 (5-7.1)
Serum Creatinine	2.5 (2-4.2)	4.1 (2-5.1)	3.1 (2.5-5.2)
Correction time for Hypernatremia (h)	30 (20-40)	42 (24-56)	30 (24-42)
Duration of hospitalization (d)	6 (4.75-8)	7 (4.5-8.75)	6.5 (4.1-8)
*Neonates with signs of dehydration	1 (6.25%)	2 (12.5%)	3 (17.6%)

*All values in median(IQR) except *No.%*

can be managed at level II neonatal intensive care unit [10].

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Content Analysis of Commercially Available Probiotics

We carried out content analysis of four batches each of 3 commercially available probiotic formulations of *Bacillus clausii*. Species identification was done using MALDI-TOF-MS technique while bacterial count was done using plate colony count. Only one of the three probiotic formulation analyzed was found to have homogeneous population of *B. clausii* while none was found to have the exact viable bacterial count as suggested on the label.

Keywords: *Bacillus clausii, Probiotics, Reliability, Supplements.*

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World Health Organization (WHO) defines probiotics as "live microorganisms that, when administered in adequate amounts, confer a health benefit on the host" [1]. The pharmaceutical market is flooded with numerous probiotic products with very few effective checks-and-balances to regulate their quality. We intended to culture probiotic products said to contain *Bacillus clausii*, and determine the probiotic species and their count and compare it with the product label.

The study was carried out between September 2016 to January 2017. After hospital's ethical committee approval, we tested a total of 12 samples (4 each – 4 different batches) of 3 popular probiotics containing *B. clausii* namely – Product 1 (Enterogermina – Expiry range: 05/18 – 08/18),