

Clinico-Epidemiological Profile, Complications and Outcome of Hypernatremic Dehydration in Exclusively Breast Fed Infants

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ABSTRACT

Background: Hypernatremic dehydration is a known and lethal complication observed in breast fed infants which can be complicated by environmental hyperthermia.

Objectives: To find out incidence, clinico-epidemiological profile, complications and outcome of hypernatremic dehydration in breast fed infants. Setting: Tertiary level neonatal and pediatric centre in central India.

Materials and Methods: A retrospective study was conducted over a period of two years from February 2016 to January 2018. Study population consists of term and near term infants (≥ 35 weeks gestation) of age ≤ 28 days with hypernatremic dehydration and serum sodium ≥ 150 meq/l. Infants with known cause of hypernatremic dehydration like gastroenteritis, salt poisoning, diabetes insipidus, etc. were excluded.

Results: There was clustering of twenty three infants with hypernatremic dehydration during summer months. Condition was more common in male (65.22%), extramural (91.30%) babies born to primigravida (78.26%). Common clinical features at admission resembled sepsis and include fever (86.95%), letharginess (86.95%), refusal to feed (82.61%) and oliguria. Mean serum sodium was 163.5 (ranged from 150-191 meq/l) and severity of hypernatremia directly correlated with duration of symptoms. Rehydration was done slowly over 48-72 hours in most with bolus given in 3 cases who presented

with shock. Two cases who presented late with apnea, encephalopathy, shock and intrinsic renal failure expired. Rest all survived (91.30%) with average ICU and hospital stay of 6.17 and 6.82 days respectively.

Conclusion: Hypernatremic dehydration is an important, less discussed and lethal complication in breast fed infants. Environmental hyperthermia appears to be a significant etiological factor for this condition.

Keywords: Acute Renal Failure, Breastfeeding, Dehydration, Hypernatremia, Jaundice.

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Article History:

Received: 14-01-2018, Revised: 12-02-2018, Accepted: 22-03-2018

Access this article online

Website: www.ijmrp.com	Quick Response code 
DOI: 10.21276/ijmrp.2018.4.2.031	

INTRODUCTION

Breast feeding offers many nutritional, immunological, economical, environmental and social benefits which are a well known fact. The benefits of breastfeeding also include decreased incidence of a wide variety of acute infections and chronic diseases, as well as improved neurodevelopmental outcomes.^{1,2} Hence breast feeding usually on demand every 2-4 hours exclusively till six months of age is being promoted.

Though rare but an important complication of exclusive breast feeding is hypernatremic dehydration.³ Neonatal hypernatremic dehydration results from inadequate transfer of breast milk from mother to infant. Furthermore, increased environmental temperature may complicate neonatal hypernatremia. The number

of anecdotal case reports has suggested that the incidence of hypernatremic dehydration has increased in the last few years.⁴⁻⁷ The failure to diagnose hypernatremic dehydration can have serious consequences, including seizures, intracranial hemorrhage⁸, vascular thrombosis⁹ and death.^{10,11}

This problem is less discussed and there still exist serious lacunae regarding its incidence, etiology and management. Therefore, our study was planned to look for incidence, clinico-epidemiological profile, complications and short term outcome of hypernatremic dehydration in breast fed infants in our hospital which is a tertiary care hospital in central India and caters to population from Indore as well as neighboring tribal district.

MATERIALS AND METHODS

Study Design and Period: It is a hospital based retrospective study from February 2016 to January 2018 in Index medical college hospital and research centre, a tertiary care hospital catering population from Indore as well as neighboring districts, for a period of 2 years. Detailed clinical, biochemical and hematological characteristics were recorded. Admission laboratory values were used for patient classification and data analysis.

Inclusion Criteria: Study population consists of (1)exclusively breast fed infants (2) term and near term infants (≥ 35 weeks gestation) of age ≤ 28 days(3) with dehydration and hypernatremia (serum sodium ≥ 150 meq/l) admitted in neonatal intensive care unit with (4) no clinical or laboratory evidence of sepsis

Exclusion Criteria: Infants born before 35 weeks of gestation presenting after neonatal period (more than 28 days of life) were excluded from the study. Infants with known cause of hypernatremic dehydration like gastroenteritis, salt poisoning, diabetes insipidus, etc. were also not considered. Infants with congenital malformations were also excluded from the study.

Statistical Analysis: Study was conducted to find out incidence, clinic-epidemiological profile, complications and outcome of hypernatremic dehydration. Data was collected from the medical record department of the hospital. A proforma was designed to enroll all the related parameters and filled. These included epidemiological factors, weight loss from last recorded weight, day of life at presentation, feeding patterns, clinical features, investigations, treatment, complications and outcome details. Statistical analysis was performed using SPSS 17.0 version.

RESULTS

Twenty eight (28) term and near term infants of age ≤ 28 days presented with hypernatremic dehydration in the NICU; however 5 neonates were excluded as they had laboratory parameters supportive of sepsis; hence 23 neonates fulfilled the inclusion criteria which consist of 2.76 % of total admissions (n=832) over two year duration. There was clustering of the cases from April to August and not a single case was found in rest of the year.

Table 1: Maternal and neonatal characteristics of infants with hypernatremic dehydration:

Characteristic	(n)	(Percentage)
Male	15	65.22%
Female	8	34.78%
Born to primigravida	18	78.26%
Intramural birth	2	8.70%
Extramural birth	21	91.30%
Vaginally delivery	17	73.91%
Cesarean section	6	26.09%
Mean gestational age	37.3 weeks ± 2.3	
Mean birth weight	2396.17 ± 430	
Mean age at admission	9.17 (range3-21)	
Weight loss %	20.05% (range: 9.32-40%)	
Mean serum sodium at admission	163.5 (range 150-191)	

Table 2: Presenting signs in neonates with hypernatremic dehydration

Clinical features	Number	Percentage
Fever	20	86.95%
Lethargic	20	86.95%
Refusal to feed	19	82.61%
Oliguria	16	69.56%
Jaundice	10	43.47%
Convulsions	4	17.39%
Apnea	4	17.39%
Respiratory distress	3	13.04%

Table 3: Complications among neonates with hypernatremic dehydration

Complication	(n)	Percentage
ARF (acute renal failure)	14	60.87%
Jaundice	10	43.47%
Polycythemia	2	8.66%
Hypocalcemia	1	4.35%
Hypoglycemia	2	8.66%
Hyperglycemia	1	4.35%
Convulsion during rehydration	1	4.35%

The condition was more common in males (65.22%) compared to females (34.78%). Mean birth weight was 2396.17g. 65.21% (15/23) of these were born as low birth weight (≤ 2500 g). Twenty

one (91.30%) of these infants were extramural and two intramural baby who were discharged earlier at 48 hour of life. Hypernatremic dehydration was more common in infants born to

primigravida mothers 78.267% (18/23) who were discharged on 2nd-3rd postnatal day. Seventeen (73.91%) of these infants were born through vaginal route and 6 (26.09%) by caesarean section. Mean postnatal age at admission was 9.17 days (range 3-21 days) and mean gestation age at birth was 37.3 weeks. Maternal and neonatal characteristics are shown in table 1.

The main reason for seeking medical attention were fever (20/23), letharginess (20/23), refusal to feed (19/23), oliguria (16/23), jaundice (10/23), convulsions before admission (4/23), apnea (4/23) and respiratory distress (3/23). Percentage of weight loss from last recorded range from 9.32 to 40 (mean 20.05). Mean serum sodium at admission was 163.5 (range: 150-191). Table 2 represents the presenting signs of hypernatremic dehydration.

Metabolic complication in hypernatremic dehydration include: jaundice (most common, serum bilirubin >15 mg/dl) followed by polycythemia (PCV>65), hypoglycemia, hypocalcemia and hyperglycemia. Acute renal failure was present in 14/23 babies, one intrinsic renal and thirteen pre renal. Table 3 summarizes the complications seen in hypernatremic dehydration.

Signs or symptoms on presentation to the hospital prompted a full sepsis evaluation; five neonates had positive septic screen and growth on blood culture, hence excluded from the study. Blood culture was sterile in 23 infants. Though mild leucocytosis was found in seven infants, none had total leucocyte count more than 20,000/ cumm. C reactive protein (CRP) was marginally raised in 7 of 23 babies. Lumbar puncture was done in 5 cases; 2 of these showed some RBC's and rest were normal. None of the infants was found subsequently to have meningitis. Five infants in whom ultrasound cranium was done showed no abnormality. Ultrasonographic examination of the kidneys in 5 infants showed markedly hyperechoic renal medullary pyramids with speckled foci that reversed completely on therapy in the present study.

Most common (18/23) way of correcting hypernatremic dehydration was administration of intravenous (IV) fluids. Nasogastric and oral feeds were started once the infant was stabilized. Three babies received only enteral correction with expressed breast milk ± formula milk. One infant had convulsion during rehydration (when the serum sodium concentration was corrected from 167 mEq/L to 136 mEq/L over 3 days). The median time to correction of hypernatremia, defined as the time from the institution of therapy until the time the serum sodium concentration was 150 mEq/L, was 23 hours (range: 4-96 hours). Antibiotics were given in 17, anticonvulsants in 5, inotropic support in three and mechanical ventilation in two infants. Mean NICU and hospital stay were 6.17 and 6.82 days respectively.

Two infants expired and rest had insignificant morbidity at presentation. However all babies who survived had normal neurological status at discharge. 17 out of 21 infants who came in follow up at 1 month were on exclusive breast feeding with proper counseling at discharge and had normal neurological examination.

DISCUSSION

Breast feeding confers a battery of advantages to mankind and so all efforts are being made to promote exclusive breast feeding in our country. Our institute is also following all principles of baby friendly hospital initiative. Hypernatremic dehydration is a rare but known complication in exclusively breast fed infants. Most studies related to this entity are from relatively cooler nations and case reports, case series and retrospective observation studies. It was

a constant observation in central India of clustering of cases with hypernatremic dehydration in breast fed infants during peak summer months. But surprisingly there were no reports related to this entity.

In our study the incidence of hypernatremic dehydration was 2.76 % of total hospital admission in infant's ≤ 28 days which is higher than incidence reported at some other centers in world.¹²⁻¹⁴ Most studies earlier quoted decreased breastfeeding as single most important factor responsible for this condition. Our observation differs as there was clustering of cases at peak of summer from April to August suggesting environmental hyperthermia as significant contributory factor to hypernatremic dehydration. Not a single case was found in rest of the year. This fact is also supported by observation that 20 of 23 infants presented with fever as one of the presenting complaint. All mothers of these infants were culturally practicing over clothing of babies. Out of 23 babies 15 babies were kept in rooms with poor ventilation and fans were put off, other babies were staying at places where on an average 3-4 hours of day time had no electricity. All these further aggravated problem of hyperthermia. Our observation is similar to Bhat et.al¹⁵ and Livingstone et.al¹⁶ who found an higher incidence of hypernatremic dehydration in the warm months but the difference was not statistically significant.

Twenty one of 23 babies were extramural who were discharged on 2nd -3rd day suggesting that this complication is more common in facilities where early discharge was practiced and which can be prevented with proper medical supervision. Another question that arises is why babies in postnatal ward never developed this complication; reason is measures like: mothers were explained need to use light clothes, to keep babies in well ventilated rooms with efforts to keep room temperature lower and most importantly intramural babies were weighed daily in postnatal wards and kept under regular follow up. Feeding was supervised in babies with weight loss >10%. Probably these were the reasons that only two intramural baby in a year had a hypernatremic dehydration.

In our study majority (17/23) of cases have been born to primiparous (78.26%)mothers with no practical experience of breast feeding but a strong desire to breast feed , so a possibility of inadequate feeding can be thought of; in very few has the mother successfully breast fed a previous baby. None of the cases in our study had any congenital malformation causing decreased feeding. This fact is supported by findings from a recent study that revealed that 16% of exclusively breastfed infants born to primiparous women had >10% weight loss by day 3 of life, despite education and support provided by a lactation consultant.¹⁷ It is estimated that 10% of breastfed infants develop hypernatremia¹⁸ and that >33% of breastfed infants with weight loss exceeding 10% have hypernatremia.^{5,6} This suggests that breastfeeding-associated hypernatremia is much more common than thought previously, with a higher rate than reported in our study. Some authors have suggested a direct causal relationship between neonatal hypernatremic dehydration and elevated maternal breast milk sodium.^{19,20}

Signs of hypernatremic dehydration are difficult to pick up clinically because of better preservation of extracellular volume.²¹ Most infants with hypernatremic dehydration in our study presented with fever. Other features were similar to sepsis like lethargy, refusal to feed, but septic screen was negative in most. Hyperbilirubinemia, oliguria, apnea, convulsions and respiratory distress were other

and serious manifestations. Other complications detected on investigations were acute renal failure, hyperbilirubinemia, hypocalcaemia, hyperglycemia and hypoglycemia. Hypernatremia and hyperbilirubinemia each cause central nervous system depression among infants with lethargy, poor suck, and anorexia.^{22,23} These factors can lead to a cycle of worsening dehydration, jaundice, and hypernatremia, which in combination can lead to brain injury. Though initially antibiotics were started in 17 of 23 babies, once septic screen came negative antibiotics were stopped in two to five days. Similarly phenobarbitone was given in five neonates with convulsions. Two babies required mechanical ventilation and three inotropic supports.

Hypernatremic dehydration could be fatal as in two cases who presented late with encephalopathy, apnea and intrinsic renal failure. Rest (21/23) recovered completely with appropriate treatment but had an average ICU and hospital stay of 6.17 and 6.82 days respectively.

Twenty one neonates who survived had normal neurological examination at the time of discharge and at 1 month follow up,

CONCLUSION

Hypernatremic dehydration is an important complication in breast fed infants during summer months in central India. Environmental hyperthermia appears to be an important contributory factor other than decreased breast milk. Other risk factors include low birth weight, extramural delivery, primigravida, over clothing of infants and poor medical supervision. Common early clinical features are fever, letharginess and refusal to feed. Signs of dehydration are late manifestation and high index of suspicion and close supervision during summer months is warranted for early diagnosis and prevention of this entity.

RECOMMENDATIONS

Hypernatremic dehydration is a completely preventable condition in breast feeding infants. Exclusive breast feeding practices should be continued but with appropriate advice to mothers in summers to prevent dehydration. Babies with weight loss > 10% of birth weight should be under medical supervision. On the basis of the above findings, we recommended that all mothers should be taught the signs of successful breast-feeding and the warning signs of dehydration. The Baby Friendly Hospital Initiative should be followed at all facilities and health professionals must be encouraged to teach all mothers the skills of breast-feeding and importance of early routine postpartum follow-up.

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Source of Support: Nil. **Conflict of Interest:** None Declared.

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Cite this article as: Saurabh Piparsania, Prashant Choudhary, Nagesh Chandra Doharey, Saurabh Kumar Chhotelal Jain. Clinico-Epidemiological Profile, Complications and Outcome of Hypernatremic Dehydration in Exclusively Breast Fed Infants. *Int J Med Res Prof*. 2018 Mar; 4(2):144-47. DOI:10.21276/ijmrp.2018.4.2.031