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Original Research Article

Clinical profile of hypernatremia in exclusively breast-fed neonates

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ABSTRACT

Background: Neonatal hypernatremia is a potentially lethal condition. This study was planned to find out the predisposing factors and outcome of hypernatremia in breast feed late preterm and term neonates.
Methods: In defined study period, neonates with serum sodium level >145mmol/L, who satisfies all the inclusion criteria are included in the study. The data was collected using a proforma which included clinical symptoms, risk factors for neonatal hypernatremia in addition to laboratory data.
Results: The results demonstrated hypernatremia in 63 neonates with mean age of presentation being 4.5 days, mean sodium level of 154.2 and average weight loss was 13.2%. Neonates admitted at older age >7days had higher sodium concentration with mean of 162.5mmol/L. Serum sodium levels correlates positively with percentage of weight loss and correlates negatively with birth weight and was statistically significant with p value <0.05. 41(65%) of mothers were primipara, 37(58%) had delivered by LSCS and 39(62%) had lactation issues postnatally. Most common presenting symptom was jaundice in 44(71%), followed by fever in 38(61%).
Conclusions: Hypernatremic dehydration can be prevented by counselling about importance of breast feeding for the mothers starting from antenatal period, early initiation of breast feeding, addressing lactation issues and monitoring daily weight.

Keywords: Dehydration, Exclusive breast feeding, Hypernatremia

INTRODUCTION

Neonatal hypernatremia is an uncommon, potentially lethal condition.[1] From late 1990's increasing reports of hypernatremic dehydration in breastfed babies has been seen, which was previously thought to be unusual in breastfed babies. Normally exclusive breast feeding 2nd hourly on demand, with minimum intake of 30ml/ feed is advised. Adequate BM depends on several interrelated stages such as mammogenesis, lacto genesis, galactopoietics and effective milk removal. Milk removal depends on effective breastfeeding technique and milk ejection reflex.[2] Normally weight loss of up to 7% of birth weight through normal diuresis over 1st week is expected. Thereafter start gaining weight to regain birth weight by 10th day. Rapid weight loss or >7% weight loss is a concern. Hypernatremia is defined as serum sodium levels of >145meq/L.[3] Most of the neonates will have associated dehydration. CNS manifestation includes cerebral edema, intracranial hemorrhage, thrombosis and seizures.[4,5] This study was planned to find out the predisposing factors and outcome of hypernatremia in breast feed late preterm and term neonates with regular weight monitoring practices.

METHODS

A cross sectional observational descriptive study conducted from April 2018 to September 2018, in Vanivilas hospital Bangalore. Babies admitted during the

study period with hypernatremia who fulfilled the following criteria were included in the study.

Inclusion criteria

- Gestational age more than or equal to 34 weeks
- Birth weight more than or equal to 1800g
- Breast fed with no formula feed.

Exclusion criteria

- The babies who had major congenital anomalies
- Blood culture positive sepsis
- Received IV fluids within 48 hours before diagnosis of hypernatremia
- Endocrine disorders which may affect the fluid and electrolyte balance were excluded from the study.

The following data were collected: gestational age as completed weeks, age at diagnosis as completed days, birth weight, weight at diagnosis, maternal age, obstetric details about baby feeding, clinical features, treatment, complications, condition at discharge. The total weight loss and weight loss per day were calculated as a percentage of the birth weight. Excess weight loss was defined as total weight loss more than 10% or weight loss more than 5% of birth.

Axillary temperature more than 38°C was considered as fever. The rate of decline in serum sodium was calculated using the sodium before and after treatment and the time taken to achieve it. Acute kidney injury (AKI) was diagnosed if serum creatinine increased by >0.3mg/dl in 24 hours or if it was >1.5mg/dl with normal maternal renal functions.[6] Jaundice treated with phototherapy was considered as significant. Hypernatremia is categorized into mild (145-160), moderate (160-170) and severe (>170).[7] At the time of discharge, babies were said to have improved if their serum sodium level was <150meq/L and was taking feeds well.

Statistical analysis

SPSS software version 24 was used for analysis. Numerical data were presented as mean±standard deviation or median±interquartile range as appropriate. Categorical data were presented as percentages and analyzed using chi-square test.

Ordinal data were analyzed with Mann-Whitney U-test or student's t-test. Correlation was done with spearman rank correlation coefficient where appropriate. $p<0.05$ was considered as significant.

RESULTS

There were 71 babies with hypernatremia satisfying the inclusion criteria during the study period. Eight babies were excluded due to various reasons. The remaining 63 babies were considered for analysis (Figure 1).

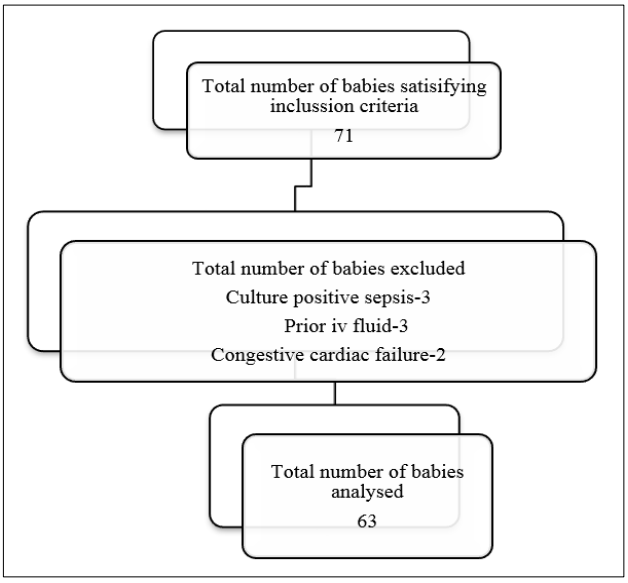

Figure 1: Flow of case in the study.

During the study period, there were 7672 live births, with 4758 vaginal births, and 2914 cesarean births. There were 3912 primiparous mothers. Hypernatremia was seen in 0.7% of vaginally born babies' and1.2%of cesarean born babies.

Table 1: Baseline characteristics of hypernatremic babies.

Characteristics	Observations
Median maternal age	24 (mean 23.5)
Number of babies born to primiparous mother	41
Number of babies born to cesarean mothers	37
Number of mothers reported problem in breastfeeding	32
Male to female ratio	1.25:1
Median gestational age	38 (mean 38)
Median age at diagnosis	4.5 (mean 4.75)
Median birth weight	2.8 (mean 2.76)
Median weight at diagnosis	2.46 (mean 2.39)
Median total weight loss from birth	13 (mean 13.5%)
Number of babies presented on 2-3 days	28
Number of babies with 10-15% weight loss	36
Number of babies with >15% weight loss	18

This difference was statistically significant (chi square 11.417, p=0.000707). 1.04% of neonates born to primiparous mother had hypernatremia and it was

statistically significant. (chi square 6.4542, p=0.0307). Lactation issue was present in 52% cases.

Out of 63 neonates in the study 35 were male and 28 were female. No statistically significant difference was noted between the genders (P=0.429) (Table 1).

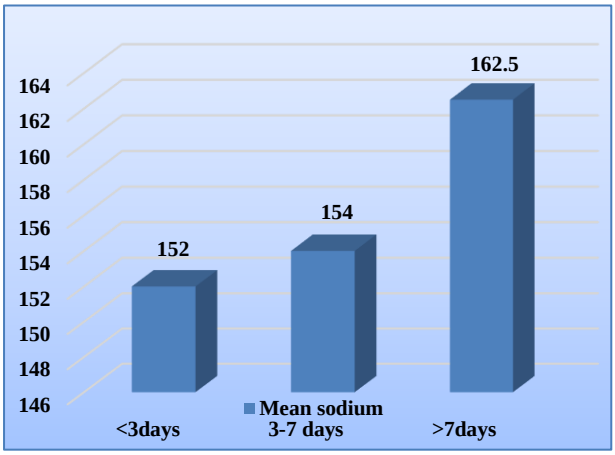

Figure 2: Mean sodium in relation to age.

The mean serum sodium concentration on admission was 154meq/l.

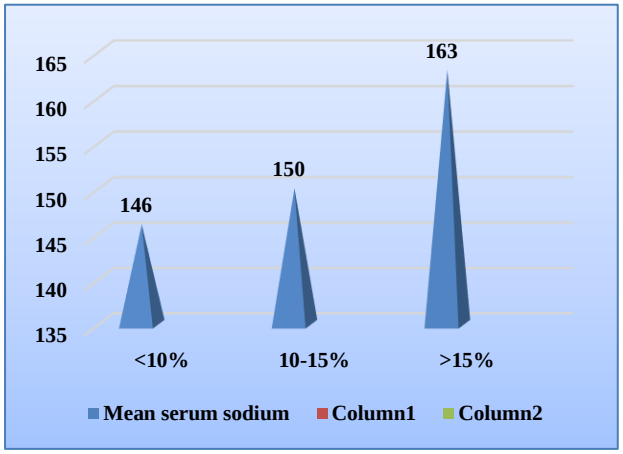

Figure 3: Mean sodium in relation to percentage of weight loss.

The mean serum sodium levels were significantly high in neonates older than 7 days and weight loss>15% being 162.5 and 163 respectively (Figure 2 and 3) (Table 2).

Serum sodium has negative correlation with birth weight and is statistically significant (r=0.332, p=0.034) (Figure 4).

A positive correlation was seen between serum sodium level at admission and percentage of total weight loss (r=0.819, p=0.0001) (Figure 5) (Table 3).

Table 2: Clinical feature and outcome of neonates with hypernatremia.

Characteristics	Observations
Mean serum sodium at diagnosis	154.2 (Median 151)
Serum sodium range and number of babies	
145-160	47
161-170	11
>170	5
Mean duration of stay	
145-160	3.5
161-170	4.7
>170	7.3
Outcome	
Improved	62
Death	1

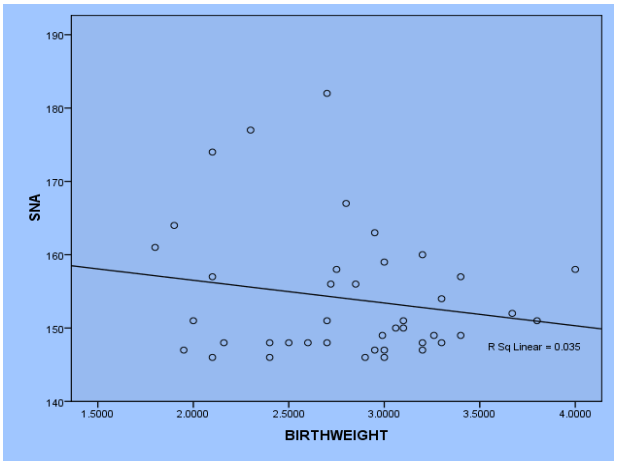

Figure 4: Scatter plot depicting correlation between mean sodium and birth weight.

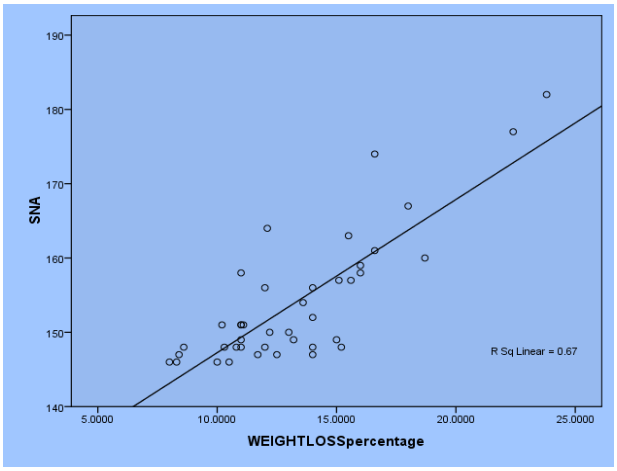

Figure 5: Scatter plot depicting correlation between mean sodium and weight loss percentage.

Most common presentation was jaundice seen in 71% cases followed by fever was seen in 61.9% of cases.

Table 3: The relationship of mean serum sodium level and hypernatremia with gravidity, gender, age group, route of delivery and weight loss.

		Mean serum sodium level	SD	P value
Gravidity	1	152.8	7.02	0.436
	2	158.2	12.6	
	3	155	10.5	
Gender	Male	153.2	8.3	0.429
	Female	155.3	9.6	
Age groups	<3 days	152	6.4	0.094
	4-7 days	154.3	7.9	
	>7 days	162.5	12.5	
Route of delivery	VD	154	9.4	1.000
	C/S	154.1	8.6	
Weight loss	<10%	146.7	0.95	0.0001
	10-15%	150	4.3	
	>15%	163	9.6	

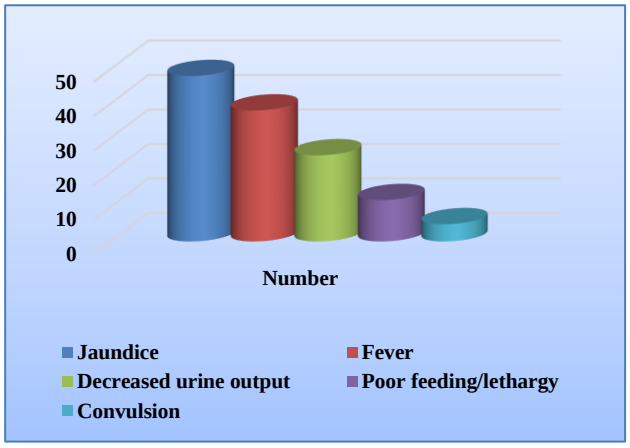

Figure 6: Complaints.

Other common clinical finding was decreased urine output in 39% and lethargy and poor feeding was seen in 19% of cases. Convulsion was seen only in 5 cases (7.9%) (Figure 6).

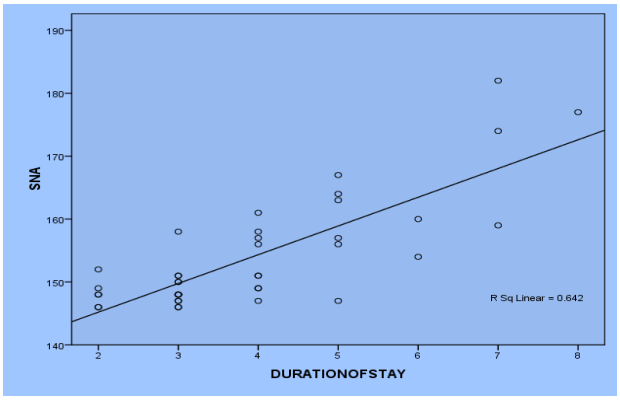

Figure 7: Scatter plot depicting correlation between mean sodium and duration of stay.

41% of babies had associated AKI. The mean urea level for all neonates with hypernatremia was 46mg/dl. There was a significant relationship noted between serum sodium and urea levels (r=0.6398, p=0.0001). Severe hypernatremia was noted in only 5 cases. Out of which 5 cases had convulsion, and of which 1 case died due to intractable convulsion. Significant positive correlation has been seen with duration of hospital stay and serum sodium levels (r=0.801, p 0.0001) (Figure 7). Out of 63 neonates 28(46%) had received treatment option 1.i.e feeds alone, 30(46.5%) received feeds with fluids, treatment option 2. Remaining 5 babies received treatment option 3.i.e. IV fluids alone. Mean s. sodium among three groups was 150.3, 154.5 and 174.8meq/l respectively. Mean comparison done by ANOVA p test was significant with p value of 0.00001.

DISCUSSION

In the current study, authors discovered a statistically significant of hypernatremia in primiparous and LSCS mothers. Although breastfeeding is an instinct behavior, mothers have to learn this simple technique and needs moral support to breastfeed her baby successfully.[8] There was a relationship noted between birth weight and serum sodium level. In the neonates most common presenting symptom was jaundice (71%), followed by fever (61%). The mean sodium level was significantly higher in neonates older than 7 days and weight loss over 15%. Furthermore, there was a relationship between mortality and presence of seizures and also between the serum sodium and urea levels. It is stated that the parents of hypernatremic babies have poor recognition of their babies' illness.[9,10] About 48% of our baby's mothers have not felt any problem with their baby's feeding behavior. Excess weight loss gave a clue to identify these cases early. Thus, majority of our cases were identified at an early age, had less severe weight loss and less severe hypernatremia. Many studies report that babies

presenting at a later age have higher weight loss and more severe hypernatremia.[11,12] Hence, daily weighing of babies along with appropriate lactation support during the first 4-5 days of life has been suggested for early detection of hypernatremia.[13-15] At admission fever, jaundice, and dehydration were common symptoms in present study population. Lavagno et al, through systematic review have found jaundice, poor feeding, and dehydration each seen in about 45% of all reported cases.[16] About 20% of our babies had no symptoms at admission except for excess weight loss. Similarly, Uras et al and Korgali et al, have found that 14% and 2.4% of their hypernatremic babies were asymptomatic at admission, respectively.[17,18] Five babies with severe hypernatremia had neurological and/or renal complications. Similarly, Ahmed et al. have found that babies with AKI presented at a later age, had higher weight loss and higher serum sodium.[19] Present study was hospital based, and many babies had a less severe degree of hypernatremia with fewer complications. A larger scale prospective study with neuro developmental follow-up is needed to have a clear understanding of the risk factors, complications and long-term effects of neonatal hypernatremia.

CONCLUSION

Hypernatremia is not rare, associated with significant mortality. Antenatally counselling of mothers about importance of breast feeding, early initiation of breast feeding, addressing the lactational issue and proper attachment and supporting the mother especially primipara and cesarean mothers postnatally in the prevention of neonatal hypernatremia is important Monitoring for jaundice, weighing the new-borns 72-96 hours after birth in the early detection of neonatal hypernatremia is critical. Most of the cases of mild hypernatremia can be treated with breast feed alone.

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