International Journal of Contemporary Pediatrics
Kadegaon B et al. Int J Contemp Pediatr. 2019 Jul;6(4):1642-1645
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20192769

Original Research Article

Asymptomatic hypernatremia in exclusively breastfed neonates

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Received: 11 April 2019
Revised: 29 May 2019
Accepted: 30 May 2019

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ABSTRACT

Background: The aim of study was to identify the asymptomatic hyparnatremia in exclusively breastfed neonates and to study the factors associated with it.
Methods: A cross-sectional study was conducted from November 2010 to October 2012 in Jawaharlal Nehru Medical College and Hospital, A. M. U., Aligarh. Consecutive term appropriate-for-gestational age and asymptomatic neonates who were exclusively breastfed since birth were enrolled.
Results: A total of 1360 term neonates were screened, out of which 145 neonates in each early and late neonatal group were enrolled. Prevalence of hypernatremia in 290 patients was 4.48% (n=13) with mean serum sodium level of 156.6±5.5 mmol/L, ranging from 151 to 167 mmol/L. It was 16 times more common in early compare to late neonates (adjusted odds ratio=16.074, P=0.001), 6 times more common in primi mothers (adjusted odds ratio=6.037, P=0.010) and 7 times more common during summer season (May-August) (adjusted odds ratio=6.566, P=0.017). Other variables like sex, mode of delivery and blood urea levels do not show significant association with hypernatremia. There was a significant positive correlation of serum sodium level with blood urea (r=0.123, P=0.037) and serum creatinine levels (r=0.157, P=0.007), and a negative correlation with blood sugar levels, but it was not significant (r=-0.072, P=0.224).
Conclusions: The prevalence of hypernatremia in exclusively breastfed term asymptomatic neonates is 4.8%, and is more common in early neonatal period, in summer season and in babies born to primi mothers. There was a significant positive correlation of serum sodium with blood urea and creatinine levels.

Key words: Exclusive breastfed neonates, Early neonate, Hypernatremia, Late neonate, Primi mothers, Summer

INTRODUCTION

Exclusive breastfeeding is the best method of feeding infants up to 6 months of age. Unfortunately, in the last two decades there are several reports of hypernatremic dehydration, a potentially devastating condition in some exclusively breast-fed infants.[1-3] Hypernatremic dehydration due to breast milk feeding usually presents between the first and third weeks of life. The infants are often lethargic, irritable, malnourished, dehydrated and born to primi mother.[4]

Hypernatremia in exclusive breastfed neonates is primarily due to low volume intake of breast milk, as a result of insufficient production or ineffective milk removal from the breast. Ineffective milk removal is in turn, primarily associated with poor breast-feeding techniques (i.e. incorrect position and latching). The net result is that the neonate becomes dehydrated while the kidneys are mature enough to retain sodium ions.[1,4]

There are however, surprisingly fewer reports of hypernatremia in exclusive breastfed neonates from Indian centers.[5-8] This is probably due to lack of awareness regarding this clinical entity; as a result of which many such cases tend to be missed or wrongly diagnosed as sepsis due to overlapping clinical features associated with both conditions.

Studies of the electrolyte composition of breast milk have shown a mean sodium value of 64.8± 4.4 meq/L after delivery, dropping to a mean of 21.4±2.3 meq/L by the third postpartum day (colostrum), and levelling off to a value of 7±2 meq/L by 2 weeks (mature milk). The quantity of breast milk obtained by neonate on first day of life is <100ml, which increases rapidly to 500 ml/day by 4th day of life.[9,10] The present study was planned to find out whether this change in quality and quantity of breast milk during initial phase of lactation will affects the serum sodium level of exclusively breastfed healthy babies during early and late neonatal periods and determine factors that may contribute to dysnatremias in these babies.

METHODS

This was a cross-sectional study conducted on neonates aged ≤28 days attending outpatient sections (Well baby clinic/ Immunization clinic) or inpatient sections (Maternity ward/ Pediatric ward) of Jawaharlal Nehru Medical College and Hospital, Aligarh Muslim University, Aligarh, during the period from November 2010 to October 2012. Consecutive term appropriate-for-gestational age and asymptomatic neonates who were exclusively breastfed since birth were eligible for enrolment during the study period. Any sick baby needing hospitalization or having diarrhea, vomiting, dehydration, adrenal dysfunction, edema, heart failure or jaundice needing phototherapy were excluded from study. Babies having feeding difficulty of recent onset (<7 days) or had received drugs like diuretic, steroids, etc. that are known to affect serum sodium levels, taken in previous 3 days were also excluded from study.

The study was approved by Ethical Committee of Jawaharlal Nehru Medical College and Hospital, A.M.U. Aligarh; and written informed consent was taken from parent/guardian. A detailed birth and obstetric history was taken and a complete physical examination especially for signs of dehydration, edema, skin pigmentation, ambiguous genitalia were performed and recorded on predesigned proforma. The eligible subjects were stratified for postnatal age into (1) Early neonate (0-7d) and (2) Late neonate (8-28d). January to April were consider as spring season, from May to August as summer and from September to December were consider as winter season for study purpose.

Serum sodium levels were measured by Blood-Gas-Electrolyte-Metabolite Analyzer using ion-selective electrode. Based on the test results the patients were classified as having hyponatremia (serum sodium <130 meq/L), hypernatremia (serum sodium>150 meq/L) or normonatremia (serum sodium 130-150 meq/L). Those patients having abnormal lab reports were referred back to the treating physician for further management.

Sample size

Considering a difference in serum sodium levels between early and late neonatal period of 5 meq/L with a standard deviation of 15, a sample size of 142 were required in each group to detect a significant difference with a power of 80% and α of 0.05. A total of 290 neonates, 145 in early neonatal group and 145 in late neonatal group were enrolled in study.

Statistical analysis

Statistical analysis was done using SPSS 17. Chi-square test and Student's t-test were used for statistical significance, and Logistic regression test was used to study the association. P values <0.05 was considered significant.

RESULTS

A total of 1360 term neonates were screened, in which 550 were early neonates and 810 were late neonates. Out of which, 405 early neonates and 665 late neonates were excluded because of one or more exclusion criteria and remaining 145 neonates in each group were enrolled in study. The mean age in early neonatal group was 4.7±1.7d ranging from 2-7d and in late group was 17.8±6.1d ranging from 8-28d. Both groups were comparable with respect to sex and mode of delivery. Late neonatal group had more primi mothers (52% vs. 37%). Most of the subjects were enrolled in summer season (May-August) in both early and late neonatal group (43% and 54%). Majority of them were born by normal delivery (80.7% in early neonate and 77.9% in late neonate).

Laboratory characteristics between early and late neonatal groups were comparable with respect to serum sodium, blood urea and serum creatinine, except for marginal difference in blood sugar levels. There was a significant positive correlation of serum sodium level with blood urea (r=0.123, P=0.037) and serum creatinine levels (r=0.157, P=0.007), and a negative correlation with blood sugar levels, but it was not significant (r=-0.072, P=0.224).

The overall prevalence of hypernatremia in 290 patients was 4.48% (n=13). The mean serum sodium level in hypernatremic patients was 156.6±5.5 mmol/L, ranging from 151 to 167 mmol/L and median value 154 mmol/L. A logistic regression test was conducted to study the association of various factors with hypernatremia in 290 neonates. A test of the full model against a constant only model demonstrated that variables like age, season and

parity made a significant contribution to prediction of hypernatremia.

Table 1: Logistic regression test for hypernatremia

Regression variables	P values	Odds ratio (Exp(B))	95% CI of Odds ratio	
			Lower	Upper
1)	Age group (Early neonate)	0.001	16.074	2.995
2)	Season (Summer)	0.017	6.566	1.400
3)	Parity (Primi)	0.010	6.037	1.530
4)	Blood urea (<40mg%)	0.072	0.294	0.078
5)	Sex (Male)	0.106	0.344	0.094
6)	Mode of delivery (ND)	0.535	0.618	0.135

It indicates that the prevalence of hypernatremia was 16 times more common in early compare to late neonates (adjusted odds ratio=16.074, P=0.001) and 6 times more common in primi mothers (adjusted odds ratio=6.037, P=0.010). The hypernatremic cases were also seen 7 times more common during summer than the rest of the year (adjusted odds ratio=6.566, P=0.017). Other variables like sex, mode of delivery and blood urea levels do not show significant association with hypernatremia.

DISCUSSION

Although there are increasing reports of hypernatremic dehydration cases in recent years, there are very few studies conduct on large population to know the incidence or prevalence of the condition. In present study the prevalence of hypernatremia in exclusively breastfed term asymptomatic neonates was 4.8% (n=13) and mean age of presentation of cases of hypernatremia was 7.2±3.4d ranging from 4-16d which was comparable with the previous studies.[11-14]

Hypernatremia was more common in early neonates born to primi mothers and during the summer season. Sex, mode of delivery and blood urea levels do not show significant association with hypernatremia. Previous studies have also reported higher incidence of hypernatremia in babies born to primi mothers.[2,12,15,16] This has been variously attributed to more chances of feeding related problems like difficulty in positioning, latching and initiation of lactation in these mothers. However, we did not find any feeding related problems in these mothers. Delay in establishment of adequate lactation during early days after birth especially in primi mothers may be contributory in at least some of the cases noted. However, Uras N et al, has not found any significant difference in hypernatremic cases with respect to parity of their mothers.[14]

Majority (76.9%) of hypernatremic cases were seen during summer (May-Aug). Bhat SR et al, had also found that the incidence of hypernatremia was higher in the warm months (April-June).[17] During summer there may be higher insensible losses that may contribute to the development of hypernatremia. Other factors as high breastmilk sodium may also be contributory factor in some of these cases during summer. In contrast Uras N et al, and Michael L et al, have not found any significant association of season on hypernatremic cases.[14,16]

Hakam Yaseen et al, had shown that the hypernatremic cases were more common in babies born by caesarean section.[18] However, in present study we did not find any association of mode of delivery on hypernatremic cases. Uras N et al, and Michael L et al, have also found the similar results.[14,16]

There was a significant positive correlation of serum sodium with urea and creatinine levels, and a negative correlation of serum sodium with blood sugar levels, but it was not significant. Uras N et al, had also found the similar correlation between sodium and urea, creatinine and blood sugar levels.[14]

CONCLUSION

In conclusion, this study demonstrates that the prevalence of hypernatremia in exclusively breastfed term asymptomatic neonates is 4.8%, and is more common in early neonatal period, in summer season and in babies born to primi mothers. There was a significant positive correlation of serum sodium with blood urea and creatinine level

ACKNOWLEDGEMENTS

Authors would like to gratitude to the patients and those parents without whose co-operation, this research would not have been possible.

Funding: None
Conflict of interest: None
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Kadegaon B, Sarvi JB. Asymptomatic hypernatremia in exclusively breastfed neonates. Int J Contemp Pediatr 2019;6:1642-5.