

Clinical Profile and Outcome of Neonates with Hypernatremic Dehydration - A Tertiary Care Hospital based Study

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ABSTRACT

Introduction: Neonatal hypernatremic dehydration is a medical emergency. Early diagnosis and appropriate treatment is crucial for survival and better prognosis. However, diagnosis is often difficult due to apparent well being and dehydration is underestimated. The aim of our study was to see the outcome of neonates admitted with hypernatremic dehydration in our hospital

Material and Methods: The study was conducted in neonatology of Postgraduate Department of Pediatrics, in GB Pant Hospital, an associated hospital of Government Medical College Srinagar. It was a hospital based prospective observational study conducted for 1 year, from March 2016 to February 2017. A total of 67 neonates were enrolled in our study.

Results: The results showed mean age of presentation 18 days, females were 37(55.5%), mean birth order was 1.6, 44 (65.7%) cases were from rural background, 62 (92.5%) of our cases were term babies, an average weight loss of 14.6% was found. There was a significant statistical relation in the percentage of weight loss, incidence of shock, incidence of AKI and sodium levels (p value < 0.001).

Conclusion: Women should be educated about the proper technique of breast feeding during prenatal visits and after the delivery of the newborn. Mothers should be informed about 'ten steps of successful breast feeding'. All breast-fed infant should be weighed at least once several days after discharge.

Keywords: Neonates, Hypernatremic Dehydration

INTRODUCTION

Hypernatraemic dehydration is a potentially lethal condition and is associated with complications like cerebral oedema, intracranial haemorrhage, hydrocephalus and, disseminated intravascular coagulation and seizures.¹

The infant's plasma sodium concentration is elevated predominantly due to loss of extracellular water. In the past, hypernatraemia occurred most frequently when artificial feeds of too high a sodium concentration were fed to babies.² Breastfeeding, as opposed to formula feeding, is considered the better option and undoubtedly provides health advantages to both infant and mother. Adequate breast milk intake depends on several interdependent processes: normal mammogenesis, lactogenesis, and galactopoiesis as well as effective milk delivery to the infant. The latter depends on effective maternal breast feeding techniques, combined with an intact milk-ejection reflex. The volume of human milk consumed daily by a neonate depends on the frequency and duration of feeds. Normal neonatal feeding is usually on

demand every 2-4 hours, with a range of 10-70 ml per feed over a period of 5-20 minute.²⁻⁵

A number of studies have documented the occurrence of hypernatraemic dehydration in breastfed infants.⁶⁻¹⁴ The age of presentation of hypernatraemic dehydration is usually around ten days with a range quoted in the literature from 3 to 21 days.¹⁵ It is normal over the first week of life for the neonate to lose as much as 5-7% of its birth weight. Neonates should regain their birth weight by the tenth day of life.^{1,2} The parents may fail to identify that the infant is ill, and professionals may also be falsely reassured by the infant's apparent well-being.¹⁵ Signs may be non-specific, including lethargy and irritability.¹⁶⁻²²

The aim of our study was to see the outcome of neonates admitted with hypernatremic dehydration in our hospital

MATERIAL AND METHODS

The study was conducted at GB Pant hospital Srinagar, Pediatric Department of Government Medical College Srinagar, a tertiary care hospital, which is a referral institute for the region. 67 neonates with normal perinatal history who subsequently got admitted for being sick and were found to have hypernatremic dehydration were recruited as cases after taking an informed consent from the parents. Serum sodium concentration and weight loss were the key parameters in our study. Special investigations were done to rule out any specific cause of hypernatremia. Patients were followed up at regular intervals for 6 months for assessment of clinical and neurodevelopmental parameters. Duration of study was around one year from March 2016 to April 2017. The study was given clearance by the ethical committee of the institution

STATISTICAL ANALYSIS

Categorical values were summarized as counts and percentages, chi square test was used to analyze the

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relationship between categorical variables. 2 sided p values were reported and p values less than 0.05 were considered significant

RESULTS

A total of 5123 neonates were admitted during the study period, which extended from 1st march 2016 to 28th February 2017. Out of these, 67 patients were diagnosed to have neonatal hypernatremic dehydration. A hospital based prevalence of 1.3% was thus observed. The mean age of presentation was 18 days with minimum 5 days and maximum 28 days. There were 37 (55.2%) female babies and 30 (44.8%) male babies. Majority of the patients i.e 39 (58.2%) were first born. 44 (65.7%) babies belonged to rural areas. 44.8% babies presented during the summer months while the remaining presented almost equally during the rest of the seasons. The presenting symptoms included refusal of feeds (58.2%), decreased urination (43.2%),

hypothermia (25.3%), jaundice (19.4%), excessive crying (47.7%), decreased activity (38.8%). 67.5% patients had greater than 10% weight loss. 25 (37.3%) patients had sodium levels greater than 170 mmol/L. More than half (13) of these patients were born to primigravidas. Table 1 summarizes the important clinical and demographic features

27 (59.7%) presented with shock at admission. Out of these, 18 babies had sodium levels of greater than 170mmol/L (table 2). Acute kidney injury (AKI) was seen in 21 (31.3%) babies out of which 19 had sodium levels greater than 170mmol/L (table 3). Other complications that were observed were seizures (5.9%), intra cranial hemorrhage (1.4%), hyperkalemia (11.9%), DIC (1.4%).

Majority of the babies (56) were exclusively breast fed with most of them having feeding problems due to faulty feeding technique, breast engorgement or inverted nipples. Sepsis was found in 24 (35.4%) babies. Congenital abnormalities were present in 11 babies including cleft palate, ankyloglossia and congenital heart disease (table 4).

Six babies expired and six were found to have developmental delay on follow up.

DISCUSSION

The study was conducted in neonatology section of the Postgraduate Department of Pediatrics at G.B.Pant hospital Srinagar, an associated hospital of Government Medical College Srinagar. It was a prospective observational study conducted for 1 year, from March 2016 to February 2017. A total of 67 neonates were enrolled in our study.

The mean age of presentation was 18 days with minimum 5 days and maximum 28 days. This observation was different from the reference studies, Verity H. Livingstone et al²¹ (8 days), Hassan Boskabadi et al²³ (9 days). The neonates in our setup were brought late or referred to our hospital in case of severe illness, (37% of our cases were having severe hypernatremia), our hospital being the only tertiary care referral center for a large geographical area, less severe cases presenting earlier being managed by the SNCUs set up by government in recent years to strengthen the peripheral healthcare.

There was a slight preponderance of females (55%) over males (45%), which was not in agreement with study conducted by Hassan Boskabadi et al²³ (44% females), Michael L. Moritz et al²¹ (48% females). This is due to lower number of males getting admitted during our study period. In addition, we studied the relationship of gender distribution in relation to sodium levels, but there was no statistically significant difference in the distribution (p = 0.620).

58.2% of our patients were 1st born. These results were comparable with Michael L. Moritz et al²¹ with 66.9% first born. We also studied the frequency of different birth orders in relation to different sodium levels, however there was no statistically significant difference for the same.

The seasonal variation in our study was in accordance with study conducted by Swarna Rakha et al²² in which incidence was higher in warmer months. This is due to the fact that during warm seasons neonates lose more body fluids in

| | |
|----------------------------------|---------------------|
| Number of patients | 67 |
| Mean age of presentation | 18 days |
| Male/Females | 30(44.8%)/37(55.2%) |
| Mean age mother | 27.5 years |
| 1 st /2nd Birth order | 39(58.2%)/17(25.2%) |
| Term | 62(92.5%) |
| Rural | 44(65%) |
| Both parents non matriculate | 43(65%) |
| Exclusively breastfed | 56(83.6%) |
| Mean weight loss | 14.6% |
| Mean Sodium levels | 169 mmol/dl |
| Shock on admission | 27(60%) |
| Complications | 33(49.2%) |

Table-1: Important clinical and demographic features

| | Shock present | Shock absent |
|----------------|---------------|--------------|
| <160 mmol/l | 6 | 16 |
| 160-170 mmol/l | 3 | 17 |
| >170 mmol/l | 18 | 7 |
| Total | 27 | 40 |

Table-2: Shock in relation to sodium levels, p=0.002

| | AKI | | Need for Peritoneal dialysis | |
|----------------|-----------|------------|------------------------------|------------|
| | Frequency | Percentage | Frequency | Percentage |
| <160 mmol/l | 1/22 | 4.5% | 0/22 | - |
| 160-170 mmol/l | 1/20 | 5% | 0/20 | - |
| >170 mmol/l | 19/25 | 76% | 7/25 | 28% |

Table-3: Relation of AKI with sodium level, p=<0.001

| | Frequency | Percentage |
|------------------------|-----------|------------|
| Faulty feeding | 36 + 11 | 70.1 |
| Congenital abnormality | 11 | 16.4 |
| Sepsis | 24 | 35.8 |

Table-4: Factors contributing to hypernatremic dehydration

the form of insensible losses due to greater surface area. In our study 44.8% cases presented during summer while no other season had more than 25% of total cases. No other study under our consideration has studied hypernatremic dehydration in neonates in relation to seasons.

65% of our cases belonged to rural areas. There were also more cases of severe hypernatremia belonging to the rural areas indicating that they had sought medical attention at later stages or that they were referred to us late due to poor recognition of their condition by healthcare personnel. This could be due to the fact that hypernatremic dehydration is known to show mild signs of dehydration despite a huge water loss from body because of preserved intravascular volume, secondary to shift from intravascular compartment. Educational status of the parents in majority of our cases was poor. >60% of parents were below matriculation/high school.

The incidence of shock had a direct relation with sodium levels with 66% of cases with sodium >170 having shock at presentation vs 11.1% in cases with sodium levels <160mmol/l ($p < 0.001$).

There was also a direct relationship between incidence of AKI and sodium levels, with >90% of patients with AKI having sodium levels >170mmol/l. This difference in frequency of AKI in relation to sodium levels was also statistically significant ($p < 0.001$). The same trend was followed by need for peritoneal dialysis, but this difference of frequency was not statistically significant.

Survival rate in our study was 91%. However all the patients who expired belonged to complicated cases with survival rate in non-complicated being 100% vs 81.9% among complicated cases, however this difference was not statistically significant ($p = 0.074$). No other study in our consideration had studied outcome.

In our study, we found that the faulty feeding/improper breast feeding was the most common factor (70%) associated with hypernatremic dehydration in neonates. This finding was in accordance with all studies done for hypernatremic dehydration so far, Verity H. Livingstone et al²¹, Hassan Boskabadi et al²³, Swarna rekha bhat et al.²² In addition we found sepsis was associated with 35.8% of cases while 16.4% had congenital abnormalities affecting feeding directly or indirectly like cleft palate, ankyloglossia, and CHDs.

Among patients with faulty feeding 50% were having improper attachment/latching, while Hassan boskabadi et al²³ had found it to be in 32% only. 27% had inverted nipples while breast engorgement and crackled nipples were in 5.5% and 16.6% respectively. These problems are usually found in combination due to their direct relationship with each other. For example, if a mother is having improper attachment of newborn with her breasts, she is likely to develop breast engorgement and sore nipple. Also 23.4% were associated with feeding other than breast milk, many of whom were given improperly diluted formula feeds or undiluted cow's

milk.

On follow up we could track only 54 cases. We found developmental delay in 6 patients (11.1%) using TDS charts, which is a screening method. These were referred for detailed neurodevelopmental examination and follow up.

CONCLUSION

Neonatal hypernatremic dehydration is a medical emergency. Early diagnosis and appropriate treatment is crucial for survival and better prognosis. However, diagnosis is often difficult due to apparent well being and dehydration is underestimated. Due to association between breast feeding and neonatal hypernatremic dehydration, breastfeeding practice is not to be discouraged, instead mothers need counseling for proper breastfeeding. Follow-up visit of mother and newborns treated for hypernatremic dehydration is to be conducted to reinforce the practice of proper breastfeeding.

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