Case Report

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Paediatrics Section

Life Threatening Severe Hypernatraemic Dehydration in Neonates: A Report of Two Cases

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ABSTRACT

Hypernatraemic dehydration in neonates may lead to potentially lethal consequences like cerebral oedema, intracranial haemorrhage, hydrocephalus and gangrene. In the light of increase in the infants presenting with hypernatraemic dehydration, there is a definitive need to heighten the awareness and have a high degree of suspicion in diagnosis for this potentially lethal condition. We report two neonates of severe hypernatraemia with dehydration highlighting its diagnosis and management. Treatment of hypernatraemic dehydration involves correction of electrolyte imbalance by careful restoration of fluids and ensuring appropriate intake of calories. Promoting, protecting and supporting breastfeeding by careful breastfeeding assessment and including an early post partum follow up in the hospital protocol to detect any unusual weight loss in the newborn period plays a significant role in preventing this condition.

Keywords: Bottle feeding, Breastfeeding, Early discharge, Weight loss

CASE-1

A 21-year-old primigravida with an uneventful antenatal history delivered a male child at a Primary Health Centre (PHC) by spontaneous vaginal delivery with a birth weight of 2.925 kg. Breastfeeding was instituted by 20 minutes after the birth, the baby was discharged with the mother on third postnatal day.

The infant was brought on 16th day of life with complaints of fever, refusal of feeds and lethargy [Table/Fig-1]. The mother also reported that the baby had decreased urine output since one week. On admission, the baby was lethargic and hypotonic with sunken eyes, the skin was doughy on palpation and anterior fontanelle was also sunken. The weight of the baby was 2.1 kg, indicating a weight loss of 28%. Heart rate was 170/min respiratory rate was 54/minute, temperature 35.5^{0}C with a blood pressure of 80/42 mmHg. The respiration was shallow and the child had a weak cry on stimulation.

An intravenous line was secured and samples were drawn for blood culture, complete haemogram with peripheral smear, C-Reactive Protein (CRP), serum electrolytes and renal parameters. The child was started on Intravenous Fluids (IVF) after giving Normal Saline (NS) bolus of 10 ml/kg and antibiotics ampicillin and gentamicin were started. The initial laboratory results were as follows: Complete Blood Count (CBC): normal, peripheral smear: normal, CRP: negative, serum sodium: 188 meq/l, serum potassium: 4.1 meq/l, serum chloride: 140 mmol/l, blood urea: 220, and serum creatinine: 1.7 mg/dL. The fractional excretion of sodium was 0.8 which was in the range of prerenal azotemia. A diagnosis of severe hypernatraemic dehydration with prerenal azotemia was made. The fluids were changed to 5% dextrose in 1/2 NS with rate 1.5 times more than maintenance fluid by calculating free water deficit. Serum electrolytes and renal parameters were monitored every four hours. The laboratory investigations during the course of admission have been depicted in [Table/Fig-2].

[Table/Fig-1]: Picture of 16-day-old neonate on admission, showing marked wasting, dehydration, lethargy and poor tone.

Parameters	Normal	Day 1	Day 2	Day 3	Day 4	Day 5	Day 7
S.Sodium (meq/l)	135-145	188	180	168	158	146	145
S.Potassium (meq/l)	3.5-5	4.1	3.0	3.8	4.0	3.4	3.5
S.Chloride (mmol/l)	95-105	140	128	116	108	104	101
S.Urea (mg/dL)	8-28	220	141	114	96	72	32
S.Creatinine (mg/dL)	0.12-1.06	1.7	1.0	0.8	0.9	0.7	0.6
Weight (kg)	2.5-4	2.1	2.21	2.26	2.28	2.3	2.45

[Table/Fig-2]: Laboratory investigations and course (Case 1).

IVF was given for five days and breastfeeding started from day 4 of admission. Blood culture and sensitivity analysis test was negative. On fifth day of admission, complete haemogram with peripheral smear and CRP were repeated and found to be normal. Serum sodium levels showed a gradual reduction to near normal values by day 5 of admission and child also showed adequate weight gain. The child was discharged on day 7 of admission with a weight of 2.45 kg and normal serum electrolytic levels. At discharge, the child was accepting the feeds well, passing urine adequately and was neurologically normal.

CASE-2

A 20-day-old outborn female child was brought with complaints of fever for one week, and decreased feeding and decreased urine output since three days. The child was born to a primigravida with 37 weeks of gestation with an uneventful antenatal period by spontaneous vaginal delivery. Birth weight of the baby was 2.7 kg. Breastfeeding was initiated by 20 minutes after delivery.

Parameters	Normal	Day 1	Day 2	Day 3	Day 4	Day 5
S.Sodium (meq/l)	135-145	180	172	160	154	147
S.Potassium (meq/l)	3.5-5	4.3	4.2	3.7	3.8	4.2
S.Chloride (mmol/l)	95-105	130	122	166	104	102
S.Urea (mg/dL)	8-28	104	64	56	32	28
S.Creatinine (mg/dL)	0.12 – 1.06	1.1	0.8	0.6	0.5	0.5
Weight (kg)	2.5-4	2	2.16	2.18	2.16	2.17

[Table/Fig-3]: Laboratory investigations and course (Case 2).

On admission, the weight was 1.9 kg indicating a weight loss of around 26%. The baby appeared wasted with temprature 35.7^{0}C and was lethargic with clinically significant dehydration. The baby was febrile with a heart rate of 160/min, respiratory rate 48/min, blood pressure was 90/50 mmHg, perfusion was poor with capillary refilling time of four seconds, and skin pinch was delayed. On neurological examination, the neonate was lethargic and hypotonic. An intravenous line was secured and samples were drawn for blood culture, complete haemogram with peripheral smear, CRP, serum electrolytes, blood urea and creatinine. The child was given bolus of 10 ml/kg of NS and maintenance IV fluids and started on first line antibiotics as per our hospital NICU protocols i.e., ampicillin and gentamicin.

Sepsis work up, namely total counts, Erythrocyte Sedimentation Rate (ESR), CRP and blood culture and sensitivity analysis test was within normal limits. Serum sodium was reported to be 180 meq/l and potassium was 4.2 meq/l. Renal parameters were also noted to be increased, urea 104 mg/dL and creatinine 1.2 mg/dL. A provisional diagnosis of severe hypernatraemic dehydration with prerenal azotemia was made. Breast milk sodium 97 meq/l, potassium 10 meq/l, chloride 45 meq/l were normal. After obtaining the blood results intravenous fluid was changed to 0.45% NS with 5% dextrose, 1.5 times the maintenance fluid by calculating the free water deficit. Serum electrolytes and renal parameters were monitored every fourth hour to ensure that the hydration of the baby is restored and sodium correction does not exceed more than 10 meq/l per day. After 72 hours of admission to the NICU as per its guidelines, complete haemogram, CRP, blood culture and sensitivity analysis test were repeated which were then reported to be normal. First subculture of blood showed no growth as did the final culture report on day 5. Serum sodium was 147 meq/l, urea was 28 mg/dL and creatinine was 0.5 mg/dL by day 5 of admission. The laboratory investigations during the course of admission have been depicted in [Table/Fig-3]. Satisfactory weight gain was documented and renal parameters returned to normal. Baby was passing around 3 ml/kg/hr of urine by the time of discharge.

In both the cases, the babies developed hypernatraemic dehydration secondary to lactation failure thus stressing the need to support the mother after delivery to ensure that proper breastfeeding is given to neonate.

In our centre, we follow a written protocol for breastfeeding which is routinely applied by all healthcare personnel. These babies were closely followed up by the authors in the newborn and development clinic, there were no issues of concern and the development seemed to be appropriate for the age.

DISCUSSION

Hypernatraemic dehydration in breastfed neonates is now being increasingly noted. Early discharge from hospital and lack of breastfeeding counselling coupled with absence of motivation to breastfed their neonates has contributed to lethal consequences. Lactation failure leading to poor weight gain in the neonate threatens the mother to resort to artificial feeds leading to further problems associated with it [1]. Sepsis should be ruled out in both cases. Hypernatraemic dehydration is potentially lethal form of dehydration that affects central nervous system, leading to detrimental consequences such as intracranial haemorrhage, thrombosis, and even death [2].

In a retrospective study done by Moritz ML et al., of 3718 neonates, they reported that 1.9% of breastfed neonates developed hypernatraemic dehydration, which leads to one of the common reasons for hospitalisation after discharge. They further suggested that in the neonates and infants who were breastfed, hypernatraemic dehydration is one of the common causes for hospitalisation. In their study, they reported the sodium concentration to be ranging from 150 to177 meq/l, with a median of 153 meq/l [3]. Oddie S et al., too in their study among 32,015 live births reported 907 cases with hypernatraemic dehydration with serum sodium ranging from 150 to 175 mmol/l [4]. The range of serum sodium concentration was 150-182 mmol/l with a median peak of 160 mmol/l in a similar study conducted by Boskabadi H et al., [5].

In a study done by Dewey KG et al., it was noted that neonates of mothers with delayed lactation had 7.1 times more increased weight loss than the neonates without risk factors. Neonates with suboptimal breastfeeding behaviour on day 0 were more likely to have weight loss [6]. Hbibi M et al., reported cerebral venous and arterial thrombosis in a neonate due to severe hypernatraemic dehydration which was secondary to poor feeding and lactation failure [7].

Treatment of hypernatraemic dehydration involves correction of electrolyte imbalance by careful restoration of fluids and ensuring appropriate intake of calories. It is important to note that sodium correction should be done at a rate not more than 0.5 mmol/l per hour and fluids with low sodium content must be avoided. Alshayeb HM et al., reported that hypernatraemia correction rate of less than 0.25 mmol/l/hour had a higher mortality rate [8].

Managnaro R et al., emphasized that hospitals with a protocol of early discharge should encourage a follow up weight monitoring for five days [9]. Hence, cases of dehydration and hypernatraemia can be identified at an earlier stage. As rightly said by Richmond S, hypernatraemic dehydration is not a diagnosis in itself but it is a sign of a disease [10]. Every effort should be made to find out the underlying cause and address it. It is very essential to communicate to the mothers that if the infant does not regain its birth weight by day 10 or if the weight persists to fall even after day 7 further evaluations are warranted [11].

CONCLUSION

Hypernatraemic dehydration can be prevented by careful breastfeeding assessment and an early postnatal follow up to detect any unusual weight loss. Breast examination during antenatal period and support and adequate counselling for mothers can decrease its incidence.

In a resource limited setting like ours, daily weight monitoring of the newborn during the first few days of life is an economical, feasible and an effective method to recognise this condition at an earlier stage. Early evaluation and treatment can be initiated thus averting the life threatening complications associated with this condition.

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