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Hypernatremic Dehydration: About 59 Cases Collected at the Neonatal Unit of the Hospital at Peace in Ziguinchor

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ABSTRACT

Introduction: *Hypernatraemic dehydration in newborns (HDNB) is a common condition, particularly in developing countries. The clinical manifestations, which are non-specific and often misleading, depend on the severity and speed of onset. Its severity is linked to neurological damage, which can be life-threatening or lead to serious sequelae. The aim of our study was to examine the epidemiological, clinical, paraclinical and evolutionary profile of HDNB in the neonatal unit of the Peace Hospital in Ziguinchor.*

Methodology: *This was a retrospective, descriptive and analytical study conducted from 1 January 2022 to 31 March 2024. All newborns and infants under three months of age hospitalised during the study period with clinical signs of dehydration and hypernatraemia greater than or equal to 150 mmol were included. Data were entered and analysed using Sphinx software and Microsoft Office Excel 2020.*

Results: *We found a hospital prevalence of 4.98%. The average age of newborns at admission was 12 days, with extremes of 2 and 70 days. The sex ratio was 0.84. The average age of the mothers was 26 years, ranging from 17 to 41 years, and 35.59% of families had a low socioeconomic status. Among the mothers, 71.19% had received four antenatal consultations (ANC). The majority of births were vaginal, accounting for 96.61%. The average birth weight was 2760 g, ranging from 1600 to 5000 g; 69.49% of patients were exclusively breastfed (EBF).*

The main reasons for hospitalisation were fever (74.57%), dehydration (61%), refusal to feed (55.93%), jaundice (20.34%) and weight loss (13.56%). Severe dehydration was found in 77.96% of cases, followed by moderate dehydration in 11.86%. Hypernatraemia between 150 and 169 mmol/l was found in 52.58% of cases, between 170 and 200 mmol/l in 42.41% and above 200 mmol/l in 5.08% of cases. All patients received parenteral rehydration with glucose serum (SG5%) at 200 ml/kg/24h and electrolytes (Na+, K+, calcium). Nutritional management based on formula milk was used in 42.37% of cases, AME in 37.28% of cases and mixed feeding in 20.33% of cases.

The main complications found were functional renal failure (65.52% of cases), hypovolemic shock (22.41% of cases) and septic shock (6.90% of cases). The mortality rate was 15.25%, with 66.66% of deaths occurring between midnight and 8 a.m. Septic shock and hypovolemic shock were clinical criteria significantly associated with death, with identical P-values of 0.001.

Conclusion: Dehydration in newborns is a paediatric emergency that can be life-threatening and functionally compromising due to its complications, especially neurological ones.

Keywords
Dehydration, Hypernatraemia, Newborn, Ziguinchor.

Introduction
Dehydration occurs when the body loses more water than it takes in. It is a paediatric emergency and a major public health problem in developing countries.

Acute diarrhoea is the second leading cause of death in children under 5 years of age [1]. It should also be noted that dehydration can be more serious when it occurs in the neonatal period, during which it is often associated with severe malnutrition and frequent electrolyte disturbances dominated by hypernatraemia [1,2].

Hypernatraemic dehydration of the newborn (HDON) is a common condition, particularly in developing countries [2]. The clinical manifestations of HDON are non-specific and often misleading (confusion with physiological weight loss). They depend on the severity and speed of onset. Its severity is linked to neurological damage (convulsions, coma, subdural haematoma, venous sinus thrombosis, parenchymal haemorrhages) which can be life-threatening or lead to serious sequelae [3].

According to recent data, in developed countries, the incidence of HDON varies between 2.3 and 9 per 1,000 live births [4]. Prevalence varies from one study to another, ranging from 1.2 to 6% in most recent publications in America and Europe [5,6]. Prevalence is thought to be higher in developing countries, ranging from 8.2 to 14.4% in some African countries such as Tunisia, Egypt and Senegal [2,7-9].

In Africa, few studies have addressed hypernatraemic dehydration of the newborn (HDON). In Senegal, data on NHD are scarce and fragmented [2].

In order to contribute to a better understanding of NHD in Senegal, we conducted a study whose overall objective was to examine the epidemiological, clinical, paraclinical and evolutionary profile of NHD in the neonatal unit at the hospital de la Peace in Ziguinchor.

Methodology
This was a retrospective, descriptive and analytical study conducted from 1 January 2022 to 31 March 2024 (27 months). The study population consisted of newborns and infants under 3 months of age who were hospitalised in the neonatal unit during this period. All newborns and infants under three months of age who were hospitalised with clinical signs of dehydration and whose blood ionogram showed hypernatraemia greater than or equal to 150 mmol/l were included. Data were collected from hospital records and recorded on a data collection form. The data were entered and analysed using Sphinx software, Microsoft Office, Excel 2020 and Google Forms.

Results
During our study period, 1,467 newborns were admitted to our neonatal unit. We collected 73 cases of hypernatraemic dehydration, of which 59 were retained, representing a hospital prevalence of 4.98%.

The average age of newborns at admission was 12 days, with extremes of 2 and 70 days. The 8- to 29-day age group was the most represented, accounting for 49.15% of cases, followed by the 0- to 7-day age group, accounting for 40.68% of cases. There was a predominance of females (sex ratio of 0.84). 35.59% of families had a low socioeconomic status. The average parity of mothers was 4, with extremes ranging from 1 to 7. Primigravidas were more represented, accounting for 47.46%. The average parity of the mothers was 3.5, ranging from 1 to 6. Primiparas were more represented, accounting for 47.46%. The average age of the mothers was 26, ranging from 17 to 41. 71.19% of mothers had benefited from 4 antenatal consultations (ANC). Medical and obstetric histories revealed two cases of urogenital infection, one case of pre-eclampsia and one case of uterine fibroid.

Among the mothers screened, 5.56% were HIV-positive, 9.43% were HBsAg-positive and syphilis-negative. Tetanus vaccination was administered in 49.15% of cases.

The majority of deliveries (94.92%) took place in healthcare facilities, compared to 5.08% at home. The average gestational age was 38 weeks of amenorrhea (SA), with extremes of 33 SA and 42 SA. Among the mothers, 84.75% had full-term pregnancies, 5.08% had preterm pregnancies, and 10.17% had post-term pregnancies. The majority of births were vaginal, at 96.61%. RPM was found in 5.08% of cases and lasted more than 12 hours. Amniotic fluid was stained in 6.98% of cases. Seven newborns (11.86%) did not cry at birth. The APGAR score at 5 minutes was below 7 in 5.08% of cases. Resuscitation at birth was required in 9 newborns, or 15.25%. The average birth weight was 2760 g, with extremes ranging from 1600 to 5000 g. Forty-five (45) mothers, or 76.27%, received breastfeeding advice after delivery.

Eleven (11) or 18.64% of newborns had breastfeeding difficulties, including 10 due to poor sucking and 1 due to delayed milk production.

More than half of the patients were exclusively breastfed (69.49%), 25.42% were mixed-fed and 5.08% were bottle-fed. The time to breastfeeding was not specified in 89.83% of cases, but it was less than 1 hour in 5.08% of cases. The time to milk production was not specified in 86.44% of cases. It was less than 24 hours in 8.47% of cases and more than 48 hours in one case. Referrals accounted for the majority of admissions, at 64.41%.

The main reasons for hospitalisation were fever (74.57%), dehydration (61%), refusal to feed (55.93%), jaundice (20.34%) and weight loss (13.56%) (Table 1).

The associated neonatal pathologies were neonatal asphyxia (15.25%), prematurity (5.08%), RCUI (1.69%) and macrosomia

(1.69%) (Figure 1).

Table 1: Distribution of children according to reasons for hospitalization.

REASONS	Effective	Percentages
Fever	44	74,57
Dehydration	36	61,02
Refusal to breastfeed	33	55,93
Jaundice	12	20,34
Weight loss	8	13,56
Diarrhea	8	13,56
Seizure	4	6,78
Vomiting	4	6,78
Other (cough, shortness of breath, incessing crying ….)	8	13,56

Severe dehydration was found in 77.96% of the cases monitored.

The average sodium level was 169.5 mmol/l, with extremes of 150 and 206 mmol/l. Hypernatraemia between 150 and 169 mmol/l was found in 52.58% of cases, and hypernatraemia above 200 mmol/l in 5.08% of cases (Table 2). The average creatinine level was 34.8 mg/l, with extremes ranging from 5 to 145 mg/l. A creatinine level above 13 mg/l was noted in 38 patients, or 64.41%.

The average urea level was 1.39, with extremes ranging from 0.1 to 5.1 mg/l. More than half of the newborns (67.79% of cases) had a urea level above 0.45 mg/l. Other biological abnormalities were found (Table 3).

One newborn had undergone a chest X-ray, which showed no abnormalities. None of the children underwent a transfontanellar ultrasound or brain scan.

The aetiological factors found during the study were neonatal infection in 71.18% of cases and inadequate intake in 28.81% of cases.

Among the newborns, 17 (28.81%) had received a bolus of 20 cc/kg of SSI, 11 (18.64%) had received iso-group iso-Rhesus blood transfusions, and four had received noradrenaline at a dosage of 0.2 µg/kg/min.

All newborns were on antibiotics. Antibiotic therapy was adjusted according to the assessment and clinical condition. All patients received parenteral rehydration with 5% glucose serum at 200 ml/kg/24h and electrolytes (Na+, K+, calcium). Nutritional management based on formula milk was 42.37% (n=25), exclusive breastfeeding in 37.28% of cases and mixed feeding in 20.33% of cases; 38.98% of patients were on nasogastric feeding.

The average duration of tube feeding was 3 days, ranging from 1 to 11 days. Weight gain was observed in 29 (49.15%) children, with an average of 40g/day and ranging from 10 to 175g/day. The main complications were functional renal failure in 64.41% of cases, hypovolaemic shock (22.03%) and septic shock (6.77%) (table 4).

The time taken to correct hypernatraemia was less than 72 hours in 20.43% of cases and more than 72 hours in 66.10% of cases. The rate of correction of hypernatraemia was less than 0.5 mmol/l/h in 59.32% of cases (Figure 2).

The average length of hospitalisation was 7 days, ranging from 1 to 18 days. We recorded 9 deaths, representing a mortality rate of 15.25%. Deaths occurred between midnight and 8 a.m. in 66.66% of cases (n=6).

In the analytical study, septic shock and hypovolemic shock were clinical criteria significantly associated with death, with identical P-values of 0.001.

Table 2: Classification according to serum sodium.

Natremia mmol/l	Effective	Percentages (%)
[150 - 159]	18	30,50
[160 - 169]	13	22,08
[170 - 179]	13	22,08
[180 - 200]	12	20,33
> 200	3	5,08

Table 3: Summary of other biological tests.

Other biological tests		Effective	Percentages (%)
Hemoglobin	Severe anemia	1	1,69
	Moderate anemia	17	28,81
	Normal	41	69,49
White blood cells	Hyperleukocytosis	41	69,49
	Leukopenia	0	0
	Normal	17	28,81
Platelets blood	Thrombocytopenia	15	25,42
	Thrombocytosis	02	3,39
	Normal	42	71,19
Glucose	Hyperglycemia	21	35,59
	Hypoglycemia	5	7,47
	Normal	33	55,93
Renal insufficiency	Yes	38	64,41
	No	21	35,59
C-reative protein	Positive	24	40,67
	Negative	35	59,33

Table 4: Distribution according to the complications found.

Complications	Effective	Percentages %
Functional renal failure	38	64,41
Hypovolemic shock	13	22,03
Septic shock	4	6,77
Disseminated intravascular coagulation	1	1,69
Severe anemia	1	1,69
Nil	20	33,89

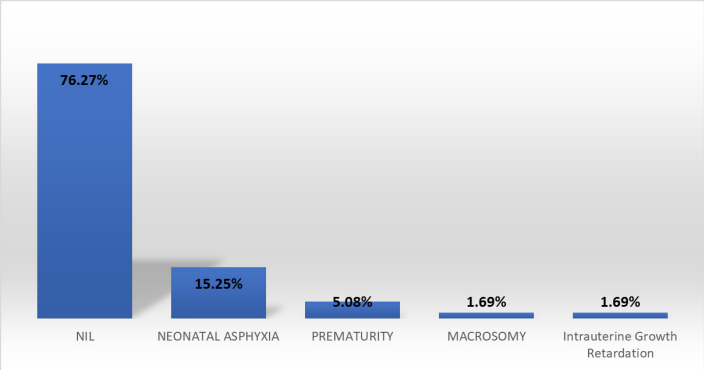

Figure 1: Répartition selon les terrains associés.

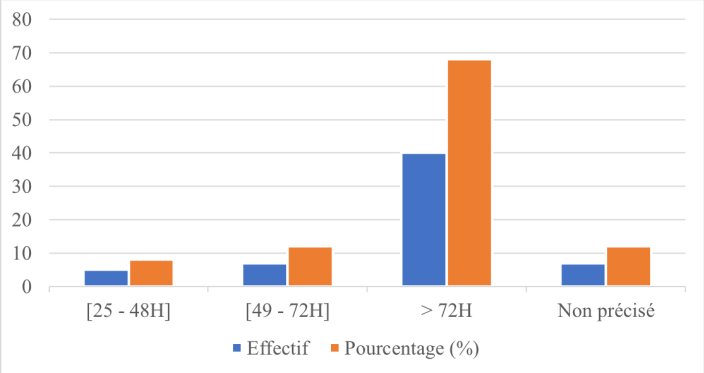

Figure 2: Distribution according to the time elapsed since correction of serum sodium.

Discussion

In our study, the hospital prevalence was 4.98%. This prevalence is probably underestimated due to limitations encountered, such as the systematic absence of ionograms. Studies conducted in Senegal and around the world have reported prevalence rates ranging from 1.1% to 8% [2,5,10]. The average age was 12 days, a period close to the first postnatal visit after returning home, where the mother stays for more than 7 days before her visit. This period could explain the insidious onset of signs of dehydration following breastfeeding difficulties, especially in primiparous women who are not always well prepared for exclusive breastfeeding (EBF). Newborns of young mothers are more prone to breastfeeding difficulties due to poor technique or a higher incidence of breast complications. Moritz and Yassen showed that there is a statistical link (P<0.05) between primiparity and the occurrence of hypernatraemic dehydration in newborns [8,11]. Mortiz et al. hypothesised that primiparous mothers had significantly lower breast milk production than multiparous mothers during the first week postpartum [4,11].

In our study, 35.59% of parents had a low socio-economic status and 28.81% of mothers had no schooling. This may explain the delay in admitting newborns and the failure to comply with feeding requirements, suggesting a probable link with the onset of dehydration. Yaseen and Karadeniz showed that there is a statistical link between socio-economic status, level of education and the occurrence of hypernatraemic dehydration (P<0.05) [7,8].

During the study, 81.36% were eutrophic, 16.95% were hypotrophic and 1.69% were macrosomic. Faye et al. noted in their study that 19.6% were born with a low birth weight of less than 2500 g, of which 5% had a birth weight of less than 1000 g [2]. Livingston et al. showed in their study that premature babies, due to their immature physiology, are more likely to develop severe complications during hypernatremic dehydration [5]. This contrasts with Zachariassen, who showed that macrosomia is a risk factor for hypernatremic dehydration [12].

In our study, the percentage of weight lost was greater than 10% (severe) in 77.96% of cases; regular weighing during the first days of life should therefore be an effective means of prevention, as has been demonstrated in certain studies [7,13].

In our series, the aetiological factors were neonatal infection in 71.18% of cases and inadequate intake in 28.81% of cases.

Neonatal infection had been identified as a major aetiology in hypernatraemic dehydration [14]. However, inadequate intake remained significant, as insufficient fluid intake could be caused by breastfeeding difficulties, errors in calculating fluid requirements, or inadequate management of diets [15].

In the literature, mixed rehydration was more commonly used, along with rigorous electrolyte monitoring [9,16].
The predominance of artificial feeding (42.37%) in our study could be attributed to several factors, including low educational attainment, difficulties with breastfeeding, primiparity, death or absence of the mother, and limited breastfeeding advice.

The rate of correction of hypernatraemia was less than 0.5 mmol/l/h in 59.32% of cases in our series, which was similar to that reported by Sweeney et al., who observed that 60% of newborns were corrected at a comparable rate, highlighting the importance of cautious correction to avoid neurological complications [17].

The prognosis for life-threatening hypernatraemic dehydration in newborns varies greatly from country to country.

Analysis of the timetables reveals that 67% of deaths (n=6) occurred between midnight and 8 a.m. This concentration of deaths during the night could indicate several factors. It is possible that monitoring is less intensive during the night, probably due to the absence of monitoring equipment and a shortage of paramedical staff, which could delay the recognition of clinical deterioration in newborns. The study by Smith et al observed that treatment protocols could vary between on-call teams, which could affect the management of critical cases during the night [18].

Septic shock and hypovolaemic shock were clinical criteria significantly associated with death, with identical P-values of 0.001.

This finding was consistent with the literature, in which these two complications were recognised as major predictors of mortality in hypernatraemic dehydration [11,16,18]. Apart from hypovolaemic shock, no other factors were implicated in our study.

Conclusion

Dehydration in newborns is a paediatric emergency that can be life-threatening and functionally compromising due to its complications, particularly neurological ones. It is a fairly common occurrence in neonatal intensive care units. The water composition of newborns, the immaturity of their kidneys and their dependence on others to meet their water needs are factors that expose them to the risk of dehydration, which can sometimes be severe. Prevention requires raising awareness about breastfeeding.

References

1. Rambeloson SH, Rabevazaha NA, Raharison TA. Facteur de risque de la déshydratation hypernatrémique du nouveau-né. Rev Malg Péd. 2022; 5: 13-20.
2. Faye PM, Dieng YJ, Sow NF, et al. La déshydratation hypernatrémique du nouveau-né au service de néonatologie du centre hospitalier National d'Enfants Albert Royer de Dakar. J Pediatrie Pueric. 2020; 33: 69-76.
3. Clarke TA, Markarian M, Griswold W, et al. Hypernatremic dehydration resulting from inadequate breastfeeding. Pediatrics.1979; 63: 931-932.
4. Jonguitud Aguilar A, Calvillo Robles S, Ruiz Martínez E, et al. Protocolo de manejo en deshidratación hipernatrémica Neonatal. Perinatol Reprod Hum. 2015; 29: 65-69.
5. Livingstone VH, Willis CE, Abdel Wareth LO, et al. Neonatal hypernatremic dehydration associated with breast-feeding malnutrition: a retrospective survey. CMAJ. 2000; 162: 647-652.
6. Cooper WO, Atherton HD, Kahana M, et al. Increased incidence of severe breastfeeding malnutrition and hypernatremia in a metropolitan area. pediatrics. 1995; 96: 957-960.
7. Karadeniz BL, Akcay F, Altinkaynak K, et al. Hypernatremia in Breastfed New borns: A Review of 149 Cases. J Trop Pediatr. 2011; 58: 332-324.
8. Yaseen H, Salem M, Darwich M. Clinical presentation of hypernatremic dehydration in exclusively breast-fed neonates. Indian J Pediatr. 2004; 71: 1059-1062.
9. Chouchane S, Fehri H, Chouchane C, et al. La déshydratation hypernatrémique chez enfant: étude rétrospective de 105 cas. Arch de pédiatrie. 2005; 12: 1697-1702.
10. González C, Mateo J, Pérez A. Risk Factors for Hypernatremic Dehydration in New borns: Findings from a Spanish Hospital. J Neonatal Nursing. 2012; 18: 274-279.
11. Moritz ML, Manole MD, Bogen DL, et al. Breastfeeding-Associated Hypernatremia: Are We Missing the Diagnosis. Pediatrics. 2005; 116: 343-347.
12. Zachariassen G, Juvonen P. Neonatal dehydration (dehydration fever) in newborn infants. Ugeskr Laeger. 2002; 164: 4930-4934.
13. Boskabadi H, Maamouri G, Ebrahimi M, et al. Neonatal hypernatremia and dehydration in infants receiving inadequate breastfeeding. Asia Pac J Clin Nutr. 2010; 19: 301-307.
14. Smith J, Jones M, Anderson P, et al. Neonatal infections and fluid imbalance. J Neonat Med. 2020; 35: 221-229.
15. Taylor R, Lee C, Hamilton J. The impact of infections on neonatal hydration. Clinical Pediatrics. 2019; 58: 310-315.
16. Ayus JC, Armstrong DF, Arieff A. Effects of hypernatremia in the central nervous system and its therapy in rats and rabbits. J Physiol. 1996; 492: 243-255.
17. Sweeney K, Thompson M, Davies B. Neonatal Hypernatremia: Outcomes and Endocrinol. 2017; 30: 443-448.
18. Smith J, Wilson L, Johnson T. Causes of hypernatremia in neonates: A retrospective study. Newborn Care Rev. 2017; 29: 101-108.