

DESHIDRATACION HIPERNATREMICA

DESAFIOS NEONATALES EN EL CONSULTORIO DEL PEDIATRA

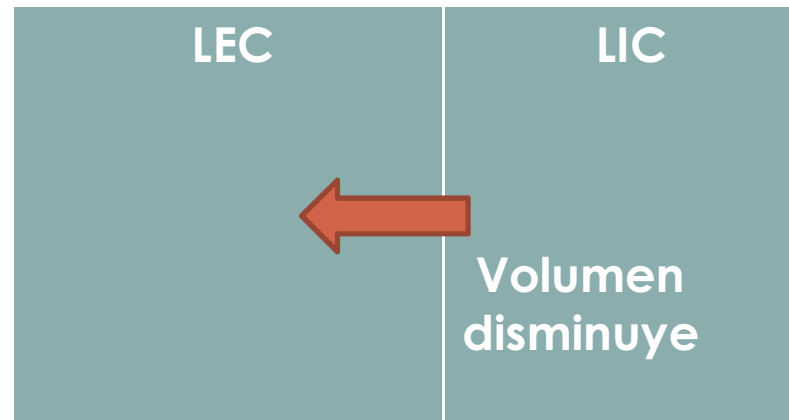
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CONARPE 2017 Córdoba

DESHIDRATACIÓN HIPERNATREMICA

Nivel Na \geq 150 mEq/ L

El agua se desplaza del LIC al LEC

Disminuye el volumen intracelular



Definition	Serum (Na ⁺), mmol/l
Hyponatremia	<135
Normal	135-145
Mild hypernatremia	146-149
Moderate hypernatremia	150-169
Severe hypernatremia	>170

¿Qué es Deshidratación hipernatremica en neonatos de término asociada a lactancia materna exclusiva?

- Descripciones a partir de los 90
- Resulta de una inadecuada transferencia de leche del pecho materno al niño
- Ausencia de patología en el RN y/o la madre

Pediatrics

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Breastfeeding-Associated Hypernatremia: Are We Missing the Diagnosis?

Michael L. Moritz, Mioara D. Manole, Debra L. Bogen, J. Carlos

^{A B S T R A C T} Abstract

Objectives. To assess the incidence and complications of breastfeeding-associated hypernatremic dehydration among hospitalized neonates.

Study Design. A retrospective study was conducted at Children's Hospital of Pittsburgh over a 5-year period, to identify otherwise healthy term and near-term (≥ 35 weeks of gestation) breastfed neonates (< 29 days of age) who were admitted with serum sodium concentrations of ≥ 150 mEq/L and no explanation for hypernatremia other than inadequate milk intake.

Results. The incidence of breastfeeding-associated hypernatremic dehydration among 3718 consecutive term and near-term hospitalized neonates was 1.9%, occurring for 70 infants. These infants were born primarily to primiparous women (87%) who were discharged within 48 hours after birth (90%). The most common presenting symptom was jaundice (81%). Sixty-three percent of infants underwent sepsis evaluations with lumbar puncture. No infants had bacteremia or meningitis. Infants had hypernatremia of moderate severity (median: 153 mEq/L; range: 150–177 mEq/L), with a mean weight loss of 13.7%. Nonmetabolic complications occurred for 17% of infants, with the most common being apnea and/or bradycardia. There were no deaths.

Conclusion. Hypernatremic dehydration requiring hospitalization is common among breastfed neonates. Increased efforts are required to establish successful breastfeeding

TABLE 1. Maternal and Neonatal Characteristics of Infants With Breastfeeding-Associated Hyponatremia Versus Control Subjects

Characteristic	Study Subjects*	Control Subjects
No. of patients	70	21 158
Birth weight, kg, mean \pm SD (range)	3.25 \pm 0.4 (2.5–4.2)	3.4 \pm 0.5
Weight loss, %, mean \pm SD (range)	13.7 \pm 5.9 (3–29)	NA
Gestational age, d, mean \pm SD (range)	38 \pm 4.9 (35–42)	39 \pm 1.4
Age at admission, d, mean \pm SD (range)	5.4 \pm 3.1 (2–16)	NA
Maternal age, y, mean \pm SD (range)	29 \pm 5.7 (17–43)	29 \pm 6
Male gender, %	56	51
Race (nonwhite), %	82	79
First-born, %	87	43†
Vaginal delivery, %	90	81
Maximal sodium concentration, mEq/L, median (range)	153 (150–177)	NA
Complications, %	20	NA

NA indicates not available.

* Complete data were available for >90% of cases with the exception of maternal age, which was known in only 50% of cases.

† $P < .05$.

TABLE 2. Presenting Signs of Breastfeeding-Associated Hy-
pernatremia

Signs	%
Jaundice	81
Poor oral intake	61
Low urine output	36
Fever	20
Lethargy	14
Red diaper syndrome (uric acid crystals)	4

[Pediatr Int.](#) 2008 Feb;50(1):29-34. doi: 10.1111/j.1442-200X.2007.02507.x.

Breast-feeding-associated hypernatremia: retrospective analysis of 169 term newborns.

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Abstract

BACKGROUND:

The aim of the present paper was to define the incidence, complications, morbidity and mortality of hypernatremic dehydration due to inadequate breast-feeding in a neonatal intensive care unit.

METHODS:

A retrospective study was carried out between 2002 and 2005, to identify the term breast-fed neonates with serum sodium level > or =150 mEq/L at the Ministry of Health Ankara Diskapi Children's and Research Hospital.

RESULTS:

The incidence of hypernatremic dehydration secondary to inadequate breast-feeding was 4.1%, occurring in 169 term infants among 4136 hospitalized term neonates with the following characteristics: mean gestational age, 39.1 weeks (37-42 weeks); birthweight, 3352 g (2200-4500 g); mother's age, 26.1 years (17-38 years); weight loss, 15.9% (5.4-32.7%); proportion of spontaneous vaginal deliveries, 75.7%; and proportion of first-time mothers, 74.6%. Major presenting symptoms were neonatal jaundice (47.3%) and poor infant suck (29.6%). The median sodium; blood urea nitrogen (BUN); and creatinine levels on admission were 155 mmol/L (150-194 mmol/L), 35 mg/dL (7-253 mg/dL), and 0.9 mg/dL (0.2-10 mg/dL), respectively. Major complications were as follows: acute renal failure, 82.8%; elevated liver enzymes, 20.7%; disseminated intravascular coagulation, 6.5%; brain edema, 5.2%; intracranial hemorrhage, 3.6%; cavernous sinus thrombosis, 1.2%; and bilateral iliac artery thrombosis, 0.6%. Ten patients (5.9%) developed seizure within the first 24 h of rehydration therapy with a mean sodium decrease of 11.9 mmol/L per day (4-19 mmol/L per day). Two patients (1.2%) died. There were positive correlation between weight loss and serum sodium, BUN, bilirubin levels ($P < 0.01$); there was no correlation between weight loss and mothers' age, education level, delivery route, or first-born status ($P > 0.05$).

CONCLUSIONS:

Hypernatremic dehydration in neonates due to inadequate breast-feeding is a serious, potentially devastating and life-threatening disorder, and can damage the central nervous system. Follow up of infants for adequate breast-feeding is important. Pediatricians must maintain a high level of suspicion, especially in cases of pathologic infant weight loss after delivery

Table 1 Patient characteristics

	Median (range)
Birthweight (g)	3400 (2200–4500)
Gestational age (weeks)	39 (37–42)
Postnatal age (days)	5 (2–22)
2–5, <i>n</i> (%)	99 (58.6)
6–10, <i>n</i> (%)	45 (26.6)
>10, <i>n</i> (%)	25 (14.8)
Weight loss (%)	15 (5.4–32.7)
>15, <i>n</i> (%)	84 (49.7)
10–15, <i>n</i> (%)	66 (39.1)
<10, <i>n</i> (%)	19 (11.2)
Serum sodium on admission (mmol/L)	155 (150–194)
BUN level on admission (mg/dL)	35 (7–253)
Creatinine level on admission (mg/dL)	0.9 (0.2–10.0)
pOsm (mOsm/kgH ₂ O)	320.7 (307.5–424.6)
AST (IU/L)	42 (12–189)
ALT (IU/L)	22 (8–282)

ALT, serum alanine aminotransferase; AST, serum aspartate aminotransferase; BUN, blood urea nitrogen; pOsm, plasma osmolarity.

Table 3 Maternal demographic factors

	<i>n</i> (%)
Maternal age (years); mean (range)	26.1 ± 4.8 (17–38)
Delivery mode	
Spontaneous vaginal	128 (75.7)
Cesarean section	41 (24.3)
Consanguineous parents	21 (12.4)
First-time mothers	126 (74.6)
Mothers' education level	
Primary school	96 (56.8)
Lyceum	57 (33.7)
High school	16 (9.5)
Mothers	
Employed	43 (24.4)
Unemployed	126 (75.6)

Breast-feeding-associated hypernatremia: retrospective analysis of 169 term newborns

Table 2 Presenting symptoms, complications and mortality of hypernatremic dehydration

	<i>n</i> (%)
Presenting symptom	
Jaundice	80 (47.3)
Poor infant suck	50 (29.6)
Fever	26 (15.4)
Bloody urine	4 (2.4)
No symptom	4 (2.4)
Other	5 (3)
Fever	
Determined in the hospital	56 (33.1)
Vascular	
Circulatory collapse	52 (30.8)
Renal	
Pre-renal azotemia	116 (68.6)
Acute intrinsic renal failure	24 (14.2)
Renal parenchymal hyperechogenicity	8 (4.2)
Nephrocalcinosis	1 (0.6)
ARF treated with peritoneal dialysis	3 (1.8)
Elevated liver enzymes	31 (23.1)
Hematologic	
IHB treated with phototherapy	125 (74)
DIC	11 (6.5)
Bilateral iliac artery thrombosis	1 (0.6)
Metabolic	
Hypoglycemia on admission	14 (10.5)
Hyperglycemia on admission	3 (1.8)
Metabolic acidosis on admission	28 (16.6)
Central	
Seizure	10 (5.9)
Brain edema	7 (4.1)
Intracranial hemorrhage	4 (2.4)
Cavernous sinus thrombosis	2 (1.2)
Mortality	2 (1.2)

ARF, acute renal failure; DIC, disseminated intravascular coagulation; IHB, indirect hyperbilirubinemia.

Breastfeeding Medicine

Hypernatremic Dehydration in Breastfed Term Infants: Retrospective Evaluation of 159 Cases

Ünver Korğalı Elif, Cihan Meriç Kaymak, Oğuzalp Tahir, Şahinbaş Ali, and Ekici Mahmut.
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ABSTRACT

Objectives: The aim of this study was to reveal the frequency, presenting complaints, risk factors, complications, and ways for prevention of hypernatremic dehydration (HD) among term breastfed infants.

Methods: The files of 159 breastfed term infants hospitalized because of HD between the years 2009 and 2014 were examined retrospectively in the Neonatal Intensive Care Unit of Sivas State Hospital, Turkey. The patients were classified according to serum sodium (Na) levels, group 1 (Na: 146–149 mEq/L, $n = 68$) and group 2 (Na ≥ 150 mEq/L, $n = 91$).

Results: The most common complaint was fever (67.9%), and the most common physical finding was oral mucosal dryness (76%). There were positive correlations between serum Na levels and weight loss, hospital stay, admission age, admission to neonatal unit after discharge, serum urea levels, and body temperature ($p < 0.05$). The normalization period of Na levels was significantly longer (21.7 ± 8.8 versus 29.3 ± 17.8 hours, $p = 0.03$), and Na reduction rate was faster in group 2 (0.41 ± 0.3 versus 0.50 ± 0.3 mEq/L/hour, $p = 0.02$). Bradycardia was seen more commonly in group 2 (1.5% versus 16.5%, $p = 0.002$).

Conclusions: HD is a significant condition that should be treated appropriately to avoid serious complications.

TABLE 1. DEMOGRAPHIC AND LABORATORY CHARACTERISTICS OF HYPERNATREMIC NEWBORNS (159 CASES)

Gender, female, <i>n</i> (%)	75 (47.2)
Gestational age, weeks ^a	39 ± 1.2
Birthweight, g ^{a,b}	3,371 ± 404 (2,500–4,500)
Admission weight, g ^{a,b}	3,064 ± 396 (2,140–4,000)
Age of admission to hospital, day ^{a,b}	3.15 ± 1.91 (1–16)
Length of hospitalization, day ^{a,b}	3.09 ± 1.88 (1–13)
Weight loss, % ^{a,b}	9.56 ± 4.20 (2.42–26.61)
Mother's age, year ^{a,b}	26.32 ± 5.48 (15–43)
Parity, primipara, <i>n</i> (%)	96 (60.4)
Way of delivery, NSVD, <i>n</i> (%)	100 (62.9)
Place of birth, SSH, <i>n</i> (%)	133 (83.6)
Transferred from, home, <i>n</i> (%)	99 (62.3)
Season, summer, <i>n</i> (%)	87 (54.7)
Serum sodium level, mmol/L ^{a,b}	152 ± 5.2 (146–185)
Serum creatinine level, mg/dL ^b	0.9 (0.3–3)
Serum urea level, mg/dL ^b	41.6 (8–259)
Total bilirubin level, mg/dL ^b	9.5 (1.2–28.5)
Serum glucose level, mg/dL	63 (27–163)
Serum K level, mmol/L ^b	4.9 (2–8)

^aMean ± standard deviation.

^bMedian (data range).

K, potassium; NSVD, normal spontaneous vaginal delivery; SSH, Sivas State Hospital.

Presentación clínica

*signos no tan evidentes de
deshidratación*

ictericia

irritabilidad

disminución de diuresis

pérdida de peso

fiebre

deposiciones escasas

cristales de urato

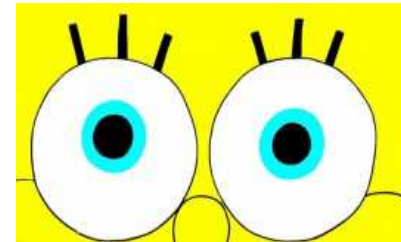


Figura N° 1
Pérdida de peso, ictericia,
irritabilidad, somnolencia



Figura N° 2
Contracturas musculares en manos

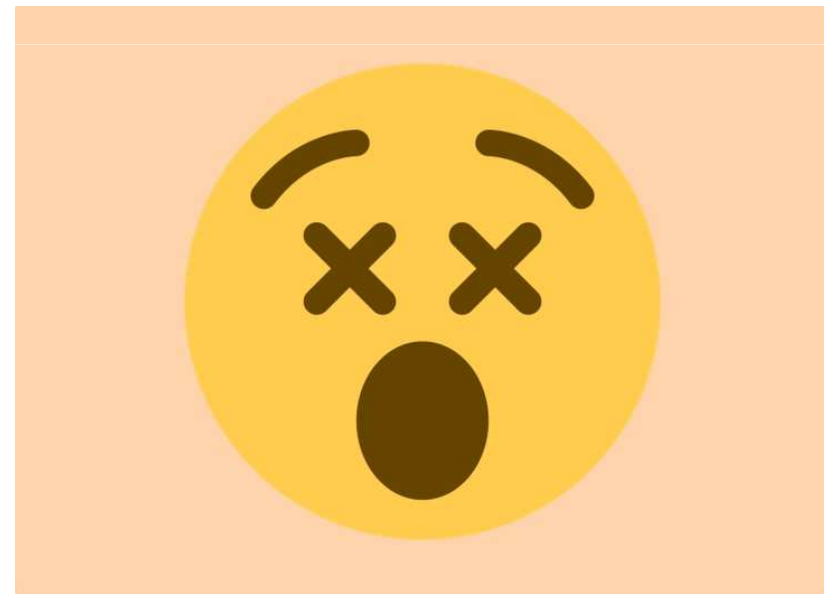


Figura N° 3
Contracturas musculares en dedos
de pies




Factores de riesgo

- Neonato
- De término
- Alimentación materna exclusiva



Complicaciones

- Hiperbilirrubinemia indirecta
- Insuficiencia renal
- Enzimas hepáticas elevadas
- Coagulación intravascular diseminada
- Hemorragia intracraneana
- Trombosis del seno cavernoso
- Convulsiones
- Edema cerebral
- Muerte



DESHIDRATACIÓN
HIPERNATREMICA ASOCIADA
A LA ALIMENTACIÓN CON
PECHO MATERNO EXCLUSIVO:

PREVENIBLE

Lactancia efectiva/afectiva



Embriogénesis

Estrógenos



Desarrollo puberal:
desarrollo de los conductos



Madurez

Embarazo

Desarrollo
lobulilloalveolar

Mamogénesis

Ciclo de
lactancia

Lactancia

Lactogénesis

Destete

Galactopoyesis

Lactancia:
proceso de
secreción de
leche y se
prolonga en
tanto se extraiga
la misma de la
glándula en
forma regular.



Lactancia normal

Size of a newborn's stomach



Day 1
size of a cherry
5 - 7 ml
1 - 1.4 teaspoon



Day 3
size of a walnut
22 - 27 ml
0.75 - 1oz



Day Week
size of an apricot
45 - 60 ml
1.5 - 2 oz



One Month
size of a large egg
80 - 150 ml
2.5 - 5 oz

Health & Parenting

Lactancia normal

Calostro	Leche transición	Leche madura
Dentro de los 3-4 días postparto	Dentro del 4 ^o al 15 ^o día postparto	Variaciones según horario del día, tomas, mamas.
Aspecto amarillento espeso poco volumen	Entre 4 ^o -6 ^o día incremento brusco de volumen	Dependiente de las necesidades del niño
De 2 a 20 ml por toma		Entre 700-900 ml/día

Puede no ser suficiente la alimentación al pecho materno?

alimentación con horarios y
escasa frecuencia

ausencia del ciclo de
llenado y vaciado de
mamas pre y post lactancia

Lactogénesis II
Galactopoyesis

técnicas incorrectas

introducción de
suplementos de fórmula

Pérdida de peso posnatal

Para evitar la suplementación innecesaria con fórmula es necesario conocer cuanto peso es esperable perder.

1,5% peso diario ?

no más de 7% del peso de nacimiento?

Hasta el 10% del peso de nacimiento?

The Healthy Newborn Hydration Model

A New Model for Understanding Newborn Hydration Immediately After Birth

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First Published April 15, 2014 Research Article

The normal small volume of breast milk produced in the first 2 days following birth may raise concerns about adequate hydration in breast-fed newborns. These concerns are further magnified when breast-fed infants lose $\geq 7\%$ of their birth weight within 2 days postnatally. Weight loss following birth is presumably mostly water loss that could result in hypohydration and subsequent hypernatremic dehydration. However, excess fluid loss immediately following birth is a normal and necessary process. Furthermore, newborns exposed to excess fluid intake during labor may need to lose $\geq 7\%$ of birth weight in the first 2 days following birth in order to achieve euhydration. Normal newborn fluid loss following birth confounds the use of weight loss as the sole measure of newborn hydration. We thus propose the healthy newborn hydration model that highlights the normalcy of newborn weight loss immediately following birth and the healthy newborn's compensatory mechanisms for preserving adequate hydration. We also recommend the use of serum sodium to measure intravascular osmolarity in addition to monitoring weight loss to obtain a more comprehensive newborn hydration assessment. Research is necessary in healthy newborns to identify relationships among fluids received in utero, newborn weight loss, and hydration, as evaluated with laboratory measures, in the first 2 days following birth. This information will guide clinicians in correctly identifying newborns with inadequate hydration who are in need of supplementary fluids versus newborns with adequate hydration for whom exclusive breast-feeding can be supported and encouraged.

recomendaciones

- Política de control de peso posnatal
- Asesoramiento y acompañamiento de la lactancia
- No demorar la primer alimentación al pecho materno
- Evitar altas institucionales precoces si no se puede asegurar control clínico a las 24-48 hs. del alta.
- Medición de concentración de Na sérico al momento de la pesquisa metabólica
- Uso de tablas de percentilos de descenso de peso posnatal



amamantar.....acompañados y cuidados