Diana L. Montoya Melo
PGY 1 Pediatrics

A 5 mo. male patient is brought to the ED by his mom, with a history of vomiting x 3 today, associated with decreased activity level. Patient had been drinking well until today, and mom is mixing the formula using 6oz water/2 scoops of powder, and he is also taking 1 oz. water 4x day. PE: W: 50%, L: 15%, HC: 15%, PR: 162, BP: 87/52, RR:32. Remarkable for decreased LOC, Bilateral dilated pupils, poorly reactive. LCTA bilaterally, no retractions. RRR, no murmurs. Abdomen soft, non-tender, non distended. No HSM. Cap refill 3 secs.

5 minutes after you leave the room, your patient start seizing…

- Which of the next set of labs would you expect to find on this patient:

A. Gl: 26, Na: 137, Cl: 100, K: 3.8, CO2: 22, BUN: 9, Cr:0.3
B. Gl: 62, Na: 117, Cl: 90, K: 5.6, CO2: 16, BUN: 6, Cr: 0.4
C. Gl: 76, Na: 130, Cl: 95, K: 5.3, CO2: 12, BUN: 6, Cr: 0.4
D. Gl: 52, Na: 128, Cl: 90, K: 2.7, CO2: 16, BUN: 12, Cr: 0.4

- Which of the next set of labs would you expect to find on this patient:

A. Gl: 26, Na: 137, Cl: 100, K: 3.8, CO2: 22, BUN: 9, Cr: 0.3

B. Gl: 62, Na: 117, Cl: 90, K: 5.6, CO2: 16, BUN: 6, Cr: 0.4

C. Gl: 76, Na: 130, Cl: 95, K: 5.3, CO2: 12, BUN: 6, Cr: 0.4

D. Gl: 52, Na: 128, Cl: 90, K: 2.7, CO2: 16, BUN: 12, Cr: 0.4

HYPONATREMIC SEIZURES

- Hyponatremia → influx of water into the intracellular space → cellular swelling → cerebral edema and encephalopathy
- The clinical manifestations are primarily neurologic

Table 3.

Anatomic Changes and Clinical Symptoms of Hyponatremic Encephalopathy

Anatomic Changes	Clinical Symptoms
Brain swelling	Headache
	Nausea
	Vomiting
Pressure on rigid skull	Seizures
Tentorial herniation	Respiratory arrest

Moritz M L , Ayus J C Pediatrics in Review 2002;23:371-380

HYPONATREMIC SEIZURES

- Children → high risk for developing symptomatic Hyponatremia → higher brain-to-skull size ratio
- Symptomatic Hyponatremia
  - SIADH
  - Post-operative Hyponatremia
  - Oral water intoxication→ one of the most common causes of symptomatic Hyponatremia in healthy infants; 70% of infants <6 mo. who develop **seizure**s that have no apparent cause are found to have Hyponatremia due to water intoxication.
  - Diuretics

- What is the next best step in the management?

A. 25% dextrose bolus 2ml/kg IV

B. Normal saline bolus 20ml/kg

C. Start D5 1/4 NS maintenance fluids.

D. Fosphenytoin 20mg/kg and fluid restriction

E. Hyper Sal (3%) 1ml/kg – 8ml/kg per hour or until seizure activity ceases.

- What is the best next step in the management…

A. 25% dextrose bolus 2ml/kg IV

B. Normal saline bolus 20ml/kg

C. Start D5 1/4 NS maintenance fluids.

D. Fosphenytoin 20mg/kg and fluid restriction

E. Hyper Sal (3%) 1ml/kg – 8ml/kg per hour or until seizure activity ceases.

HYPONATREMIC SEIZURE

- Affected patients should be treated with hypertonic saline (3%)

- The rate of infusion should raise the Na concentration by about 1 mEq/L (1 mmol/L) per hour until either the patient becomes alert and **seizure**-free/ Na increases by 20-25 mEq/L / Na of 125 to 130 is achieved, **whichever occurs first**.

HYPONATREMIC SEIZURE

- If the patient is seizing or showing other signs of increased ICP infusion rate should be increased to raise the Na level by 4 to 8 mEq/L during the first hour or until the **seizure** activity ceases.

- Assuming that total body water comprises 50% of total body weight, 1 mL/kg of 3% NaCl in water will raise the Na by about 1 mEq/L (1 mmol/L).

REFERENCES

- Moritz ML, Ayus JC. New aspects in the pathogenesis, prevention, and treatment of hyponatremic encephalopathy in children. Pediatr Nephrol. 2010 Jul;25(7):1225-38. doi: 10.1007/s00467-009-1323-6. Epub 2009 Nov 6. Review. PubMed PMID: 19894066
- Bruce RC, Kliegman RM. Hyponatremic seizures secondary to oral water intoxication in infancy: association with commercial bottled drinking water. Pediatrics. 1997 Dec;100(6):E4.
- Sharf RE. Seizure from hyponatremia in infants. Early recognition and treatment. Arch Fam Med. 1993 Jun;2(6):647-52.
- Moritz ML, Ayus JC. The pathophysiology and treatment of hyponatraemic encephalopathy: an update. Nephrol Dial Transplant. 2003 Dec;18(12):2486-91.
- Moritz ML, Ayus JC. Disorders of water metabolism in children: hyponatremia and hypernatremia. Pediatr Rev. 2002 Nov;23(11):371-80.

THANK YOU!