



HYPOVOLEMIC HYPONATREMIA

Dr.Venkateswari Ramesh, DCH, DNB
Consultant Pediatrician

SPECTRUM OF HYPOVOLEMIC HYPONATREMIA

CASE SCENARIO 1	GASTROINTESTINAL LOSS
CASE SCENARIO 2	URINARY LOSS
CASE SCENARIO 3	CUTANEOUS LOSS
CASE SCENARIO 4	URINARY LOSS REQUIRING SPECIFIC THERAPY
CASE SCENARIO 5	THIRD SPACE LOSS

Initial assessment

HISTORY

H/o renal or extrarenal
loss

H/o Hypotonic fluid intake

Urine output

Organ involvement

SYMPTOMS

Apathy, anorexia, nausea,
vomiting

Altered sensorium, seizures

Abnormal posturing, coma

Musculoskeletal symptoms like
cramps, weakness

SIGNS

Hydration status

Signs of dehydration



- ✓ **What history and physical findings will support your diagnosis?**
- ✓ **Have you identified any underlying risk factors?**
- ✓ **What other diagnostic tests would you like to do?**
- ✓ **What will be the steps in the management?**

CASE SCENARIO 1

15 months old toddler is brought with complaints of diarrhoea and vomiting for 2 days, lethargy and decreased urine output for 1 day

Lethargic
PERL+

RR: 40/min
no retractions

HR: 146/min, Pulses ++/+

BP: 106/70 mmHg

CRT 4 seconds

Sunken eyes

Skin turgor goes back very slowly

Oral mucosa dry

Urea – 48

creatinine – 0.5

Na – 122, K – 3

HCO₃ – 12

WEIGHT
9kg

What history and physical findings will support your diagnosis?

➤ H/o GI loss

➤ Lethargy, signs of severe dehydration, no shock

Have you identified any underlying risk factors?

➤ Elicit h/o Hypotonic fluid intake (oral / IV)

What other diagnostic tests would you like to do?

➤ Not needed

What will be the steps in the management (9kg)?

Restore intravascular volume with isotonic saline

10% dehydration (Shock)

0.9NS 20ml/kg (180ml) over 20min and reassess

Reassess hydration status, follow up serum sodium

Oral Rehydration Solution

CASE SCENARIO 2

3 year old child diagnosed to have TB meningitis with hydrocephalus, underwent VP shunt. On isotonic fluid. On POD2, child had a brief seizure. Urine output was 4ml/kg/hr

Postictal state
PERL+

RR: 30/min
Airway
maintainable

WEIGHT
12kg

HR: 120/min, Pulses ++/+
BP: 110/68 mmHg
CRT <3 seconds
Sunken eyes
Oral mucosa dry

CBG – 120
Urea – 50
creatinine – 0.6
Na – 118, K – 3.8
HCO3 – 18

What history and physical findings will support your diagnosis?

➤ H/o polyuria, seizures

➤ Postictal state, signs of dehydration

Have you identified any underlying risk factors?

➤ CNS infection

What other diagnostic tests would you like to do?

➤ Urine sodium

Urine Na <20 mEq/L

GI Loss

Excessive sweating (Cystic fibrosis, heat stroke)

Third space loss (pancreatitis, peritonitis, burns, bowel obstruction)

Urine Na >20 mEq/L

Diuresis

Nephropathy

Cerebral Salt Wasting

Adrenal insufficiency

Pseudohypoaldosteronism

CSW vs SIADH

- Hyponatremia
- Association with intracranial disease
- Concentrated urine
- Urine sodium $>20\text{mEq/L}$
- Hypouricemia
- **Volume status: low in CSW, normal/high in SIADH**
- Treatment: normal saline, 3%NaCl if symptomatic, oral salt supplement, role for fludrocortisone

What will be the steps in the management (12kg)?

Severe neurologic symptoms (seizures, coma) irrespective of etiology

3 – 5 ml/kg (50ml) of 3% NaCl over 10 – 15 minutes

Repeat Serum sodium

3% NaCl infusion can be repeated again if needed (persisting seizures)

Each ml/kg of 3% NaCl – increases serum Na by 1 mEq/L & Osmolality by 2mOsm/kg

What will be the steps in the management?

Judicious monitoring of sodium

Severe / symptomatic – monitor every 2 – 4 hrs

Correction at a rate of 0.5 – 1 mmol/L/hr

Avoidance of an overly quick normalization of the serum Na

Acute: 6 – 8 mEq/L over 24hrs

**Chronic (>48hrs) : 6 mEq/L over 24hrs – risk of Osmotic
Dysmyelination Syndrome**

CASE SCENARIO 3

10 months old infant with cystic fibrosis on pancreatic enzyme supplement, is brought for routine follow up.

Alert
PERL+



RR: 40/min

HR: 124/min, Pulses ++/+
BP: 96/68 mmHg
CRT <2 seconds
Hydration normal

Urea – 19
creatinine – 0.49
Na – 122, K – 3
Cl – 89, HCO₃ – 30

What history and physical findings will support your diagnosis?

➤ Sweat loss

Have you identified any underlying risk factors?

➤ Cystic fibrosis

What other diagnostic tests would you like to do?

➤ Not needed

➤ Hypochloremic hyponatremic metabolic alkalosis (suspect CF)

What will be the steps in the management?

Asymptomatic, chronic hyponatremia

Oral salt supplement

CASE SCENARIO 4

2yrs old child with Nephrotic syndrome on 2mg/kg oral prednisolone for 4 weeks, is brought with c/o fever, abdominal pain for 2 days

Lethargic
PERL+

RR: 32/min



WEIGHT
10 kg

Temp 102F, HR: 150/min, Pulses +++/+
BP: 108/74 mmHg
CRT 4 seconds
Cool peripheries

Urea – 36
creatinine – 0.5
Na – 122, K – 5
HCO₃ – 16

What history and physical findings will support your diagnosis?

➤ Nephrotic syndrome on steroid (immunosuppressed)

Have you identified any underlying risk factors?

➤ Adrenal insufficiency

What other diagnostic tests would you like to do?

➤ Not needed

What will be the steps in the management?

Stress dose of steroid (Hydrocortisone 50mg/m²)

0.9NS 20ml/kg (200ml) over 20minutes and reassess

Antibiotic

CASE SCENARIO 5

4yrs old child, diagnosed to have dengue fever is referred in view of lethargy, vomiting, thrombocytopenia and increasing abdominal distension

Lethargic
PERL+

RR: 34/min
Air entry decreased
in right axillary area

WEIGHT
15kg

HR: 102/min, Pulses ++/+
BP: 100/70 mmHg
CRT <3 seconds
Tender Hepatomegaly+

PCV 40%
SGOT 240, SGPT 118
Urea – 30 creat – 0.6
Na – 124, K – 3.8
HCO₃ – 18

What history and physical findings will support your diagnosis?

➤ Features of third spacing – capillary leak

Have you identified any underlying risk factors?

➤ Dengue fever with warning signs

What other diagnostic tests would you like to do?

➤ Not needed

What will be the steps in the management?

0.9NS (7ml/kg/hr) 105ml/hr for 2 – 3 hrs

PCV monitoring

No need for 3%Nacl

SPECTRUM OF HYPOVOLEMIC HYPONATREMIA

CASE SCENARIO 1	DIARRHEAL LOSS	ISOTONIC SALINE
CASE SCENARIO 2	CEREBRAL SALT WASTING	SYMPTOMATIC: 3% NaCl
CASE SCENARIO 3	CYSTIC FIBROSIS	ORAL SALT SUPPLEMENT
CASE SCENARIO 4	ADRENAL INSUFFICIENCY	STRESS DOSE OF STEROID
CASE SCENARIO 5	DENGUE FEVER	ISOTONIC SALINE

PREVENTION:

- ✓ Providing adequate Na⁺ intake
- ✓ Checking serum Na⁺ levels in high risk patients
- ✓ Avoiding hypotonic fluids

A wooden-framed chalkboard with a black surface is centered on a rustic wooden desk. The words "Thank You" are written in white, serif, all-caps font. To the left, a portion of a bright orange rotary telephone is visible. To the right, the corner of a black typewriter is seen. The background is a dark, weathered wooden surface.

Thank
You