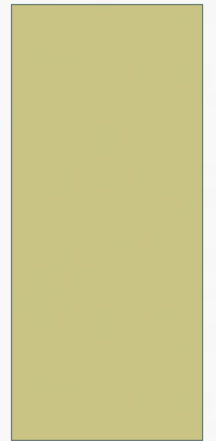


# CASE 1

UNEXPLAINED HYPONATREMIA



## Caucasian female, 54 years old, admitted July 10 2017

**MC:** none due to the severity of condition

**PMH:** unknown

### **History of present illness (taken from the accompanying person):**

- During last week she had runny nose, cough, headache
- July 10 2017 at 3 a.m. her neighbor heard a noise in the kitchen
- At 6 a.m. she was found on the floor unconscious
- At 10 a.m. she was delivered to our hospital and admitted to the ER

### **At admission:**

- Deep somnolent, Glasgow Scale 11
- Out of verbal touch
- Mild neck stiffness
- Pupils round, D=S
- Vivid photoreaction
- Irregular movements of extremities
- Muscle tone and power normal
- Tendon reflexes vivid, D=S
- Feet signs positive, D=S

**Diagnostic considerations: stroke? meningitis?**

### **At admission to ICU:**

- ❑ Body temperature 36.8°C, RR 18 per minute, pulse regular 97 per minute, BP 155/95 mm Hg, SpO<sub>2</sub> 95% (room air)
- ❑ Well nourished, skin moist, normally coloured, no oedema or palpable peripheral lymph nodes. HEENT and neck otherwise normal. Lungs: no dullness to percussion, any rhonchi, wheezes or rubs. Heart: regular rhythm, no murmur. Abdomen soft, non-tender, bowel sounds normal. Liver +2 cm below rib arch, non-painful, spleen and kidneys not felt. Urination is free, urine normally coloured

Patient was transmitted to ICU, intubated, and started on mechanical ventilation, antibiotics and normal saline infusions  
 Ureteral catheter was placed, urine output 150 mL

### Point-of-care work-up in the ICU:

	WBC x10 <sup>9</sup> /L	Hb (g/dL)	Plt x10 <sup>9</sup> /L	ESR mm/h
July 10	23.5	14.9	304	-

	July 10
Sodium mmol/L	108
Chloride mmol/L	81
CK U/L	1709
LDH U/L	327
AlAT U/L	58
AsAT U/L	59
AP U/L	95
Amylase U/L	93
Glucose mmol/L	5.6
Creatinine µmol/L	46
Urea µmol/L	2.9
Total Bilirubin µmol/L	26
Total Protein g/L	76.9
Lactate mmol/L	3.6
Potassium mmol/L	3.2
Calcium ionized mmol/L	0.97
Bicarbonate mmol/L	23.1
pH	7.49
Osmolality mOsm/kg	221
CRP mg/dL	124

	Color	SG	pH	Protein g/L	Glucose mmol/L	WBC hpf	RBC hpf	Casts hpf	Urobilin µmol/L	Crystals
July 10	Yellow	1030	6.5	0.3	abs	0-1	1-3	abs	abs	abs

- ❑ LP: liquor colorless, transparent, protein 0.15 g/L, cytosis 39/3, glucose 4.2 mmol/L, K 2.1 mmol/L, Na 114 mmol/L, Cl 89 mmol/L, Lac 3.1 mmol/l
- ❑ ECG: otherwise normal
- ❑ Brain CT: no signs of focal brain damage, intracranial hemorrhage or trauma, left paranasal sinus contains hemorrhagic (?) liquor
- ❑ BCA ultrasound - unremarkable
- ❑ Chest CT: suggestive for bilateral multisegmental pneumonia
- ❑ ENT-specialist consult and paranasal sinus puncture – sinusitis
- ❑ Ophthalmologist's consult – retinal angiopathy
- ❑ Kidneys and abdomen ultrasound: hepatomegaly

## Diagnostic considerations:

- ❑ At that point nephrologist was invited to see the patient and search for severe hyponatremia cause
- ❑ SIADH due to meningitis or pneumonia was suspected, given patients history (runny nose, headache), CT and LP data, suggestive to meningitis, oliguria, and laboratory tests:
  - Hyponatremia
  - Hypochloremia
  - Hypokalemia
  - Hypocalcemia
  - Low plasma osmolality
  - Low urea and creatinine levels
  - High CRP
- ❑ To confirm this diagnosis 24-hours urine output calculation was demanded, and 3% saline infusions advised
- ❑ Next morning urine output was 2400 mL/24 hours, therefore SIADH was ruled out
- ❑ BP was 120/80 mm Hg
- ❑ Repeated LP showed cytos 5/3, meningitis was ruled out
- ❑ Plain chest X-ray was normal, antibiotics were discontinued
- ❑ Patient was continued on 3% saline and normal saline infusions (to avoid rapid increase of serum sodium) and potassium supplementation

Within next 4 days patient improved and was extubated  
 Conscious, alert, complaining only headache

**Additional work-up:**

	WBC x10 <sup>9</sup> /L	Hb (g/dL)	Plt x10 <sup>9</sup> /L	ESR mm/h
July 10	23.5	14.9	304	-
July 14	6.4	10.0	192	-

	July 10	July 11	July 14
Sodium mmol/L	108	119	136
Chloride mmol/L	81	87	98
CK U/L	1709		2942
LDH U/L	327		308
AIAT U/L	58		67
AsAT U/L	59		92
AP U/L	95		62
Amylase U/L	93		
Glucose mmol/L	5.6	5.8	4.5
Creatinine µmol/L	46		58.4
Urea µmol/L	2.9		2.7
Total Bilirubin µmol/L	26		8.1
Total Protein g/L	76.9		63.8
Lactate mmol/L	3.6	1.6	0.6
Potassium mmol/L	3.2	2.8	3.3
Calcium ionized mmol/L	0.97	1.06	1.08
Bicarbonate mmol/L	23.1	23.3	26.3
pH	7.49	7.34	7.45
Osmolality mOsm/kg	221	243	276
CRP mg/dL	124		

## **Final diagnosis and follow-up:**

- ❑ Additional history taking revealed that during 3-4 days before hospitalization the patient consumed up to 8 L of beer per day, didn't eat and had vomiting and diarrhoea
- ❑ She didn't deny that compulsive beer consumption episodes also happened before
- ❑ Given that, she was diagnosed with beer potomania with severe hyponatremia, cerebral edema and rhabdomyolysis (probably due to comatose state)
- ❑ Patient was discharged from ICU and followed in neurology (continued on Ringer's solute infusions)
- ❑ July 24 she was discharged



	WBC x10 <sup>9</sup> /L	Hb (g/dL)	Plt x10 <sup>9</sup> /L	ESR mm/h
July 10	23.5	14.9	304	-
July 14	6.4	10.0	192	-
July 23	5.4	11.3	265	54

	July 10	July 11	July 14	July 23
Sodium mmol/L	108	119	136	140
Chloride mmol/L	81	87	98	106
CK U/L	1709		2942	
LDH U/L	327		308	
AIAT U/L	58		67	
AsAT U/L	59		92	
AP U/L	95		62	
Amylase U/L	93			
Glucose mmol/L	5.6	5.8	4.5	
Creatinine µmol/L	46		58.4	
Urea µmol/L	2.9		2.7	
Total Bilirubin µmol/L	26		8.1	
Total Protein g/L	76.9		63.8	
Lactate mmol/L	3.6	1.6	0.6	
Potassium mmol/L	3.2	2.8	3.3	3.5
Calcium ionized mmol/L	0.97	1.06	1.08	1.16
Bicarbonate mmol/L	23.1	23.3	26.3	25.8
pH	7.49	7.34	7.45	7.4
Osmolality mOsm/kg	221	243	276	287
CRP mg/dL	124		98	

	Color	SG	pH	Protein g/L	Glucose mmol/L	WBC hpf	RBC hpf	Casts hpf	Urobilin µmol/L	Crystals
July 10	Yellow	1030	6.5	0.3	abs	0-1	1-3	abs	abs	abs
July 23	Light yellow	1007	7.5	abs	abs	0-1	1-2	abs	abs	abs

- ❑ Beer potomania is used to refer to a dilutional hyponatremia caused by excessive consumption of beer, first described in 1971
- ❑ It was also referred as electrolyte disturbances in beer drinkers: a specific “hypo-osmolality syndrome”
- ❑ Beer potomania usually manifests as:
  - Altered mental status
  - Weakness
  - Average serum sodium concentration of 108 mEq/L.
- ❑ Other abnormal lab results consistent with this diagnosis include:
  - Hypokalemia (mean potassium, 3 mEq/L)
  - Low blood urea nitrogen
  - Low urine sodium
- ❑ Another consistent finding is a recent personal history of binge drinking (more than about 5 L, or 14 cans of beer, in 24 hours) and/or history of illness (vomiting, diarrhea) that predisposed the patient to a rapid drop in serum sodium levels

❑ Factors that contribute to hyponatremia in beer potomania [8]:

- High intake of water (>5 L or 14 cans of beer/day)
- Low intake of sodium
- Low intake of protein

❑ Mechanism

- To produce 1 L of maximally dilute urine, the kidneys require 50 to 60 mOsm of solutes (mainly sodium and urea, which is a breakdown product of protein from food)
- Normally, when one consume sufficient amount of solutes from fluids and foods (600-900 mOsm/day in average), kidneys can excrete up to about 20 liters of water per day
- When one drink only beer, which is low in sodium (~40 mg/L) and protein, and eating no or only a little food and therefore consume only, for example, 250 mOsm solutes per day, kidneys will be able to excrete only about 5 liters of water per day
- All the additional water, consumed with beer will stay in the body and cause a drop of blood sodium and osmolality or specifically *euvolemic hypotonic hyponatremia*
- This can result in the movement of water from the blood into the tissues, including the brain and cause cerebral edema

- ❑ Symptoms of beer potomania are similar to water intoxication and other conditions with hyponatremia and can include:
  - Early symptoms: dizziness, impaired gait, fatigue, muscle weakness, decreased appetite, nausea or vomiting, headache
  - Late symptoms: confusion, tremor, swelling of the feet or hands, abdominal pain, muscle cramps, decreased or no urination, seizures, coma or death

#### ❑ Diagnosis

##### Blood tests:

- Sodium: low ( $<120$  mEq/L) (severe hyponatremia)
- Potassium: normal or low ( $<3.5$  mEq/L) (hypokalemia)
- Blood urea nitrogen (BUN): low ( $<7$  mg/L or  $<2.5$  mmol/L)
- Osmolality: low ( $<275$  mOsm/kg)

##### Urine tests:

- Sodium: usually low ( $<40$  mEq/L/24 h)
- Osmolality: low ( $<300$  mOsm/kg)
- Specific gravity: low ( $<1.010$ )

❑ Differential Diagnosis - other common causes of hyponatremia in a chronic alcoholic:

- Liver cirrhosis
- Congestive heart failure
- SIADH
- Hypovolemia
- Pseudohyponatremis secondary to alcohol-induced severe hypertriglyceridemia
- Cerebral salt-wasting syndrome

Two other behaviors, similar to beer potomania, which can also result in hyponatremia are compulsive water drinking (psychogenic polydipsia and “tea and toast” diet

❑ Treatment

- A person who has drunk a massive amount of beer and consumed no or little food over several days and is confused or has other symptoms of hyponatremia needs to be treated in the hospital, preferably in the ICU
- The goal of the treatment is to slowly (in the course of few days) increase the blood sodium levels toward the normal levels

Treatment *may* include:

- Total food and fluid restriction for 24 hours
- If symptoms are present: isotonic saline (0.9% NaCl)
- 5% dextrose in water)