

CASE REPORTS

Severe hyponatremia in a COVID-19 patient

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ABSTRACT

Hyponatremia is one of the most common electrolyte abnormalities found in hospitalized patients. The diagnosis of the underlying cause of hyponatremia could be challenging. However, common causes include the syndrome of inappropriate anti-diuretic hormone (SIADH), diuretic use, polydipsia, adrenal insufficiency, hypovolemia, heart failure, and liver cirrhosis. The ongoing pandemic of coronavirus disease 2019 (COVID-19) can present with severe hyponatremia. The association of hyponatremia and COVID-19 infection has been described, though pathophysiology is not clear. Here we describe a case of a 61-year-old male who presented with severe hyponatremia (Na^+ 100 mmol/L) thought to be secondary to SIADH associated with COVID-19 pneumonia.

Key Words: Hyponatremia, COVID-19, Syndrome of Inappropriate Antidiuretic Hormone (SIADH)

1. INTRODUCTION

Hyponatremia is defined as a serum sodium concentration < 135 mEq/L. Clinical presentation could vary from mild to severe or life-threatening. Severe hyponatremia is defined as serum sodium < 125 mEq/L. Hyponatremia often poses a diagnostic or therapeutic challenge. Therefore, to diagnose hyponatremia, we need to classify it based on volume status, chronicity, and specific lab measurements.^[1] Moreover, the clinical presentation is important to know whether the patient is symptomatic or asymptomatic. Common symptoms of hyponatremia are neurological symptoms (confusion, altered mental status, seizure), nausea, vomiting, and in severe cases the patient might have permanent brain damage and death.

The ongoing pandemic of coronavirus disease 2019 (COVID-19), is caused by severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2). The SARS-CoV-2 is a β -coronavirus, which is enveloped non-segmented positive-

sense RNA virus. It causes mild respiratory symptoms similar to a common cold. Around 50% of COVID-19 positive patients were found to have hyponatremia on admission.^[2]

2. CASE DESCRIPTION

A 61-year-old male presented to the emergency department with 4 days history of cough and vomiting 4-5 times per day. He had positive COVID-19 PCR two days before admission during routine screening. His past medical history includes hypertension and diabetes mellitus type 2. He was taking amlodipine 5 mg OD and metformin 1000 mg BD.

On examination, his temperature was 36.6°C , heart rate 92 bpm, respiratory rate 19/min, blood pressure 176/80 mmHg, and was saturating 98% on room air. He was in acute delirium with no clinical signs of dehydration and clinically euvolemic. His GCS was 14/15 with no focal neurological signs.

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Routine labs revealed, severe hyponatremia of 100 mmol/L(136-145 mmol/L), potassium 3.8 mmol/L(3.2-5.5 mmo/L), urea 4.20 mmol/L(2.80-8.10 mmol/L), creatinine 82 micromol/L(62-106 micromol/L), chloride 68 mmol/L(98-107 mmol/L), CRP 16.1 mg/L(< 5.0 mg/L), ferritin 442mcg/L(30-400 mcg/L) and D-dimer 0.94 mcg/L(< 0.50 mcg/L). VBGs showed pH 7.36(7.35-7.45), pCO₂ 36.7 mmHg (35-45 mmHg) and HCO₃ 21 mmol/L (22-26 mmol/L).

Plasma osmolality, urine osmolality, urine sodium, and serum uric acid were 221mOsm/kg (275-295 mOsm/kg), 447 mmol/kg (40-1,400 mOsm/kg), 42 mmol/L

(20-40 mmol/L), and 134 mmol/L(212-417 mmol/L) respectively. Other labs include 9 AM cortisol 456 nmol/L (64-536 nmol/L), TSH 0.161milli IU/L (0.27-4.2 milli IU/L), free T3 3.55 pmol/L (3.10-6.80 pmol/L), and free T4 21.9 pmol/L (12-22 pmol/).

Chest radiograph showed ground glass pulmonary infiltrate in the left mid zone suspicious for COVID-19 pneumonia. HRCT showed bilateral peripheral upper lobe ground glass changes with confluent sub-segmental air-space consolidation in the left upper and lower lobes (see Figure 1). Repeat PCR for COVID-19 was positive.



Figure 1. PA Chest Radiograph: Left middle and lower zone ground glass changes with perihilar congestion. Non-contrast CT Chest Images: (Centre) Bilateral peripheral upper lobes ground glass changes. (Right) Confluent sub-segmental air-space consolidation in the left upper and lower lobes. A tiny right pleural effusion is also present.

Based on the clinical picture, laboratory results, and the imaging, the diagnosis of severe euvolemic hypotonic hyponatremia due to syndrome of inappropriate antidiuretic hormone secretion (SIADH) secondary to COVID-19 pneumonia was raised.

Other differential diagnoses of euvolemic hypotonic hyponatremia includes adrenal insufficiency and hypothyroidism which were ruled out. Polydipsia was unlikely in the absence of excessive water intake in history & limited water access during hospitalisation. The cerebral salt wasting syndrome can mimic SIADH in terms of high urine osmolality, low serum osmolality & high urine sodium; however, patients are

hypovolemic with low BP readings & serum Na improves well in response to normal saline infusion in contrast to SIADH where a fluid restriction is warranted.

In consultation with nephrology, he was initially started with 3% hypertonic saline 40 ml/hr. After 24 hours his acute delirium was resolved with serum Na gradually improving to 109 mmol/L. Hypertonic saline was stopped with the decision to repeat sodium levels every 6 hours and fluid restriction to 800 ml per day. At the end of the two days, his Serum Na improved to 117 mmol/L. He remained asymptomatic when he was discharged with serum Na 136 mmol/L after two weeks (see Table 1).

Table 1. The patient’s sodium throughout the hospital stay

	On admission	6 hours later	24 hours later	48 hours later	1 week later	On discharge
Serum Na ⁺ (136-145 mmol/)	100	106	109	117	126	136

3. DISCUSSION

Syndrome of inappropriate ADH (SIADH) is a disorder of inadequate secretion of Anti Diuretic Hormone (ADH) which is also known as Vasopressin. Regardless of low plasma osmolality, this hormone regulates water loss through the

kidney by decreased urine output, so excessive hormone production will cause water retention & relative hyponatremia.

The diagnosis is made based on clinical history, laboratory testing and after excluding other possible causes of euv-

olemic hypotonic hyponatremia. Those patients usually presented with hyponatremia, low serum osmolality, high urine osmolality > 100 mosmol/kg & Urine sodium > 40 mEq/L.

There are several causes of SIADH, such as central nervous system (stroke, Intracranial haemorrhage, infection, trauma), Malignancy (small cell lung carcinoma, Head & neck tumours), Drugs (Antipsychotic, Anti-depressant), Pulmonary disease especially pneumonia (secondary to tuberculous, viral, bacterial), post-operative pain, HIV infection or hereditary which is known as nephrogenic SIADH where there is a gain of functional mutation in vasopressin2 (V2) receptors in the kidneys.

In our case, the patient had low plasma osmolality, high urine osmolality, low serum TSH with normal T3 and T4, with euvolemic fluid status which can all be explained by the underlying COVID-19 infection. His serum morning cortisol was normal which make the diagnosis of adrenal insufficiency less likely. Certain drugs can enhance the release of

anti-diuretic hormone (ADH) and precipitate in SIADH, but the patient was not taking any medications that enhance the release of ADH. There were no other causes to explain the cause of SIADH in this patient & was attributed to COVID-19 pneumonia as an underlying cause, there are multiple reports with cases of hyponatremia with COVID-19 infection even in the absence of chest infiltrate.^[3] Our case has the lowest plasma Na reported so far of 100 mEq/L, The mechanism of SIADH in COVID Pneumonia was not clear, but a lot of postulated theories were described.

Pain & psychological stress with COVID-19 infection can result in inappropriate ADH secretion.^[4] On the other hand Ventilation –Perfusion mismatch which results from lung injury can cause hypoxia-induced vasoconstriction & decrease left atrial filling pressure which translates as hypovolemia that can stimulate ADH.^[5]

CONFLICTS OF INTEREST DISCLOSURE

The authors have declared no conflicts of interest.

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