



# A RARE CASE OF HYPONATREMIA CAUSED BY URINARY RETENTION

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## ABSTRACT

An elderly man was hospitalized after a fall following an episode of dizziness. During the initial examination, he was found to have a distended bladder, caused by urinary retention. Moreover, he was diagnosed with severe hypoosmotic hyponatremia. After the urinary retention was resolved, the patient developed severe diuresis, and the hyponatremia corrected rapidly and spontaneously.

## KEYWORDS

Hyponatremia, urinary retention, SIADH, mirtazapine

## LEARNING POINTS

- Hyponatremia is a common affliction in the elderly population, with diverse causes, some of which are still not well understood.
- In cases of hyponatremia, urinary retention should be considered a possible cause.

## INTRODUCTION

Hyponatremia, defined as a serum sodium concentration of less than 135 mmol/l, is the most common electrolyte disturbance encountered in clinical practice, particularly among elderly and hospitalized patients<sup>[1]</sup>. This condition can range from mild (sodium 130-134 mmol/l) to severe (sodium less than 120 mmol/l). Its clinical manifestations are often related to the rate and degree of the decrease in serum sodium. Symptoms can range from subtle changes in mental status, such as confusion and fatigue, to severe neurological impairment, including seizures and coma, making timely diagnosis and management important. The underlying causes of hyponatremia are diverse and can be

broadly categorized based on the patient's volume status, i.e. hypovolemic, euvolemic and hypervolemic.

In euvolemic patients the syndrome of inappropriate antidiuretic hormone secretion (SIADH) is the most frequent cause of low sodium levels<sup>[2]</sup>. SIADH is characterized by impaired regulation of antidiuretic hormone (ADH) despite normal plasma volume, leading to water retention and subsequent dilutional hyponatremia. The causes of SIADH are numerous, ranging from central nervous system disturbances, to drugs, to infections or hereditary conditions. A less commonly recognized cause of euvolemic hyponatremia is urinary retention. It can occur acutely or chronically and is often associated with underlying urological



conditions such as benign prostatic hyperplasia (BPH), urethral stricture, or neurogenic bladder dysfunction<sup>[3]</sup>. The pathophysiology of hyponatremia in the setting of urinary retention is not fully understood but is believed to be multifactorial. One of the key mechanisms proposed is the inappropriate secretion of ADH in response to bladder distension. Bladder stretch receptors, when activated by increased urinary volume, may stimulate the hypothalamus to release ADH, even in the absence of hypovolemia or hyperosmolality<sup>[4]</sup>. This excessive release of ADH leads to water retention by the kidneys, diluting serum sodium levels, which results in hyponatremia<sup>[5]</sup>. In addition, the pain associated with bladder distension may further contribute to ADH secretion, exacerbating the condition<sup>[4]</sup>. This assumption is supported by several case reports showing that relief of urinary retention by catheterization often results in a rapid improvement in serum sodium levels. Galperin et al. reported a series of elderly patients with severe hyponatremia and urinary retention who experienced a marked improvement in sodium levels after catheterization<sup>[4]</sup>. Similarly, Parikh et al. described several cases in which bladder decompression led to normalization of sodium levels, suggesting that the bladder distension itself was a factor in triggering ADH release<sup>[5]</sup>. This case report describes a patient with severe hyponatremia secondary to acute urinary retention. It highlights the importance of considering urinary retention as a rare but treatable cause of hyponatremia, especially in elderly patients.

## CASE DESCRIPTION

A 78-year-old male was admitted to the emergency department due to a fall after a sudden attack of dizziness.

The fall occurred in a psychiatric clinic, where the patient was hospitalized and being treated for benzodiazepine withdrawal. The patient had gone for a walk in the clinic garden when he suddenly suffered from vertigo and fell backward, hitting the back of his head. The nursing staff witnessed the incident and were able to pick the patient up immediately. They reported that the patient's condition appeared unchanged right after the fall, but he later exhibited an altered mental state with intermittent agitation.

The initial clinical examination in the emergency department of our clinic showed a head wound and a distended bladder. A computer tomography (CT) scan ruled out intracranial trauma. Other neurological symptoms were not present. Due to urinary retention, a permanent catheter was placed, and nearly 3800 ml of urine was drained. The patient, however, did not report any abdominal pain. An ultrasound revealed signs of a mild bilateral renal pelvic ectasia. The laboratory results revealed a severe hypoosmotic hyponatremia with a sodium level of 112 mmol/l and serum osmolality of 249 mmol/kg, accompanied by an acute deterioration of chronic kidney disease stage G2 according to Kidney Disease Improving Global Outcomes (KDIGO) guidelines, with a creatinine level of 267  $\mu$ mol/l. On the previous day, only mild hyponatremia of 135 mmol/l and a creatinine level of 88  $\mu$ mol/l had been documented. The urine sample showed moderate leukocyturia.

Unfortunately, urine osmolality was not measured on admission. However, a urine sample was taken later, after the initial catheterization. Notably, at this time, the urine osmolality and sodium concentration were normal or low: 93 mmol/kg and 15 mmol/l respectively. The patient was admitted to our intermediate care unit for monitoring and correction of hyponatremia. The first arterial blood gas

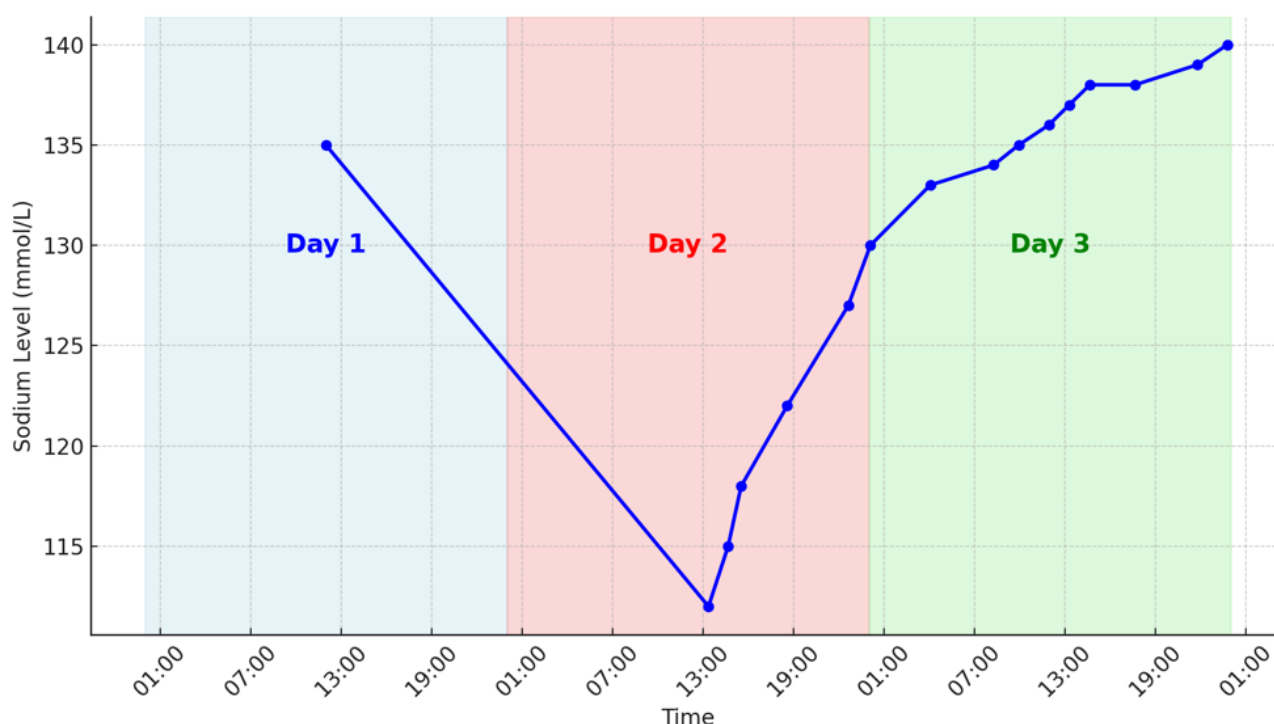


Figure 1. Sodium level over time.

analysis had already shown a spontaneous increase of the plasma sodium level. Hydration with glucose 5% solution was initiated to slow the rate of sodium increase and prevent it from rising too quickly. The patient experienced an extremely severe diuresis with a loss of almost 7,200 ml of urine within 24 hours. This volume loss was replaced with isotonic fluids. Despite this, sodium levels continued to rise, reaching 135 mmol/l within only 16 hours (Fig. 1). The creatinine level was also normalized to the patient's normal value of 81 µmol/l.

## DISCUSSION

Hyponatremia, particularly in the elderly, is a common electrolyte disturbance with a variety of etiologies. The most common reason in euvoletic patients is SIADH, also associated with many different conditions, some less recognized, such as acute urinary retention. This case report highlights that rare causes of hyponatremia should be taken into consideration, especially in the aging population.

This patient had many risk factors for developing hyponatremia: three types of psychiatric medication (mirtazapine, diazepam and quetiapine)<sup>[6]</sup>, known impaired kidney function, and advanced age. However, from the laboratory results taken the previous day it is evident, that the hyponatremia developed acutely and that made these risk factors an unlikely cause of the hyponatremia. Hyponatremia after head trauma is also a common and well-known occurrence<sup>[7]</sup>. However, since the head trauma in this patient was very mild and did not result in any intracranial injuries, it was ruled out as a possible cause of the hyponatremia in this case.

This patient also had other risk factors for developing urinary retention: BPH, the anticholinergic effect of mirtazapine<sup>[8]</sup> and possibly an asymptomatic urinary infection (*Klebsiella pneumoniae* was found in a urine sample some days later). The urinary retention likely developed gradually, since the patient did not report any discomfort, and the bladder distention was first noticed on an ultrasound examination. Since the hyponatremia resolved promptly and spontaneously after catheterization, this suggests a direct correlation between the bladder distension and ADH secretion.

Management of hyponatremia requires careful monitoring of sodium levels to avoid rapid overcorrection. Rapid correction of hyponatremia may lead to osmotic demyelination syndrome, a serious neurological complication, particularly in cases of chronic hyponatremia. However, large studies have demonstrated that this complication is rare, with no significant difference in the incidence of osmotic demyelination syndrome between rapid and slow sodium correction<sup>[9]</sup>.

## CONCLUSION

While SIADH remains one of the most common causes of euvoletic hyponatremia, urinary retention should be considered a potential cause, particularly in elderly patients presenting with both hyponatremia and bladder distension.

Clinicians should maintain a high index of suspicion for this association, as timely recognition and treatment may prevent serious complications. Therefore, the presence of hyponatremia warrants a thorough physical examination that could also be augmented with an abdominal ultrasound, if a urinary retention is suspected. This case adds to the growing body of literature supporting the hypothesis that bladder distension may trigger ADH release and lead to hyponatremia and warrants further research into the underlying mechanisms and optimal management strategies.

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