PULMONARY TUBERCULOSIS IN AN ADULT PRESENTING WITH SEVERE HYPONATREMIA: A CASE REPORT AND REVIEW OF LITERATURE

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KEY CLINICAL MESSAGE

Identifying pulmonary pathology while evaluating electrolyte disorders is crucial for optimal patient management. Physicians working in endemic regions of tuberculosis should consider this pathology as a differential for electrolyte imbalances.

ABSTRACT

Hyponatremia, a common electrolyte imbalance, can arise from various underlying etiologies such as diuretics, diarrhea, vomiting, congestive heart failure, liver and renal disease. We present a case report of a 74-year-old man highlighting the association between pulmonary tuberculosis (TB) and the development of hyponatremia. GeneXpert assay of patients sputum sample led to the identification of underlying active pulmonary TB as the cause of hyponatremia. The patient was started on anti-TB therapy, and concurrent fluid restriction and sodium supplementation were initiated to correct the electrolyte imbalance. Over the next 3 days, patient demonstrated clinical improvement with the resolution of hyponatremia. This case also highlights the importance of considering tuberculosis as a potential etiology in patients presenting with hyponatremia, especially in endemic areas. Further research is warranted to explore the mechanistic pathways linking pulmonary TB and hyponatremia, aiding in the development of targeted therapeutic interventions.

KEYWORDS: Dyselectrolytemia, Hyponatremia, Mycobacterium, Pulmonary Tuberculosis

INTRODUCTION:

Hyponatremia is defined as the depletion of sodium levels in the blood below 135 mEq/L. Sodium is essential for proper nerve and muscle function and therefore hyponatremia can cause weakness, nausea, headache, confusion, and in severe cases seizures and coma. Common causes include diuretics, vomiting, diarrhea, congestive heart failure, renal, and liver disease [1]. One of the uncommon causes of hyponatremia is pulmonary tuberculosis which is caused by the bacteria *M. Tuberculosis* that commonly affects the respiratory system but is also known to cause systemic complications.

Tuberculosis can cause hyponatremia by a variety of mechanisms, including local invasion of the adrenal glands (adrenal insufficiency), local invasion of the hypothalamus or pituitary gland, Tubercular meningitis, and incorrect ADH secretion via pulmonary infection [2]. Timely diagnosis and early management of hyponatremia in individuals with pulmonary TB is essential to prevent complications and improve patient outcomes. We present an unusual case of a 74-year-old man who presented in the emergency department with decreased consciousness and weakness of the bilateral lower limb with retention of urine.

CASE PRESENTATION:

A 74-year-old man presented to the emergency department with decreased consciousness and weakness in both lower limbs for about 6 hours for which he was brought to the emergency department. The patient had a history of recurrent urinary retention, but no fever or weight loss. He had a smoking history of 25 pack-years and was a non-alcoholic. The patient had a past medical history of pulmonary tuberculosis, which was successfully treated with antitubercular drugs under Directly Observed Treatment Short-course (DOTS) 15 years ago.

On examination, the patient was thin build and oriented to place but not to time and person. Chest examination revealed bilateral scattered wheeze over most of the lung fields, with bronchial breath sounds heard over the right upper lung region. Neurological examination showed bilateral lower limb weakness (power of 3/5) with intact sensations. Abdominal examination revealed a palpable bladder that was slightly tender. Other examinations were unremarkable. Bedside glucometer measurements indicated normal blood glucose levels.

Emergency blood investigations (**Table 1**) revealed severe hyponatremia and an elevated erythrocyte sedimentation rate (ESR). A computed tomography (CT) head scan was performed to rule out stroke, which showed age-related cortical atrophy. Magnetic resonance (MR) spine imaging showed normal findings. Chest X-ray revealed areas of fibrosis (**Figure 1**). Sputum samples were collected for Ziehl-Neelsen (ZN) stain and Gram stain examinations, which yielded normal results. GeneXpert testing on the sputum samples detected a low amount of*Mycobacterial Tuberculosis* . Further, Line Probe Assay (LPA) was conducted for drug susceptibility testing which didn't show resistance to Isoniazid and Rifampicin.

Variables	**Values**	**Laboratory reference values**
Random glucose	81 mg/dL	70-100 mg/dL
Blood Urea Nitrogen	11 mg/dL	6-16 mg/dL
Creatinine	0.6 mg/dL	0.6-1.3 mg/dL
Calcium	9.4 mg/dL	8.6-10.3 mg/dL
Sodium	**114** mmol/L	135-145 mmol/L
Potassium	4.4 mmol/L	3.5-5.0 mmol/L
Erythrocyte Sedimentation Rate (ESR)	**52** mm in 1^{st} hour	0-15 mm in 1^{st} hour (Men)

Table 1: Routine Lab Investigations

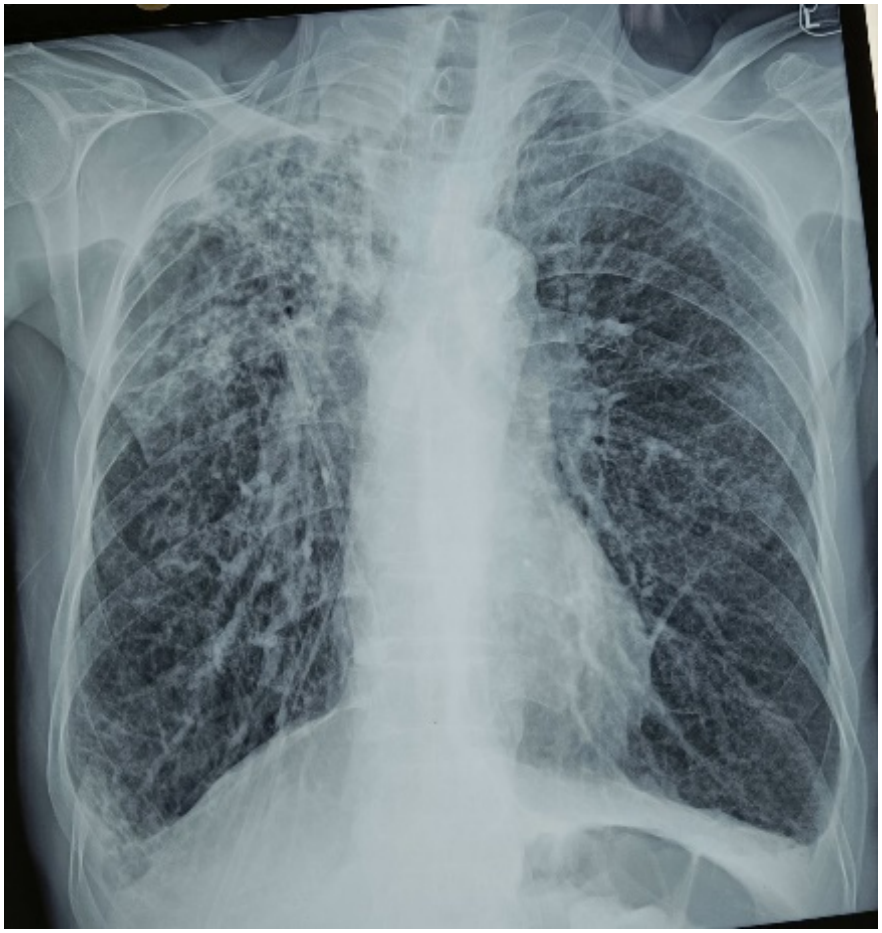

Figure 1: Chest X-ray showing diffuse areas of fibrosis in right upper lobe with deviation of trachea to the right.

The patient's hyponatremia was gradually corrected over 3 days, and he was discharged with antitubercular drugs. At the one-month follow-up, the patient demonstrated significant improvement in his symptoms and electrolytes (follow-up Sodium was 142 mmol/L) and tolerated the medications without experiencing any complications.

DISCUSSION:

The most typical presentation of tuberculosis (TB), an ancient human disease caused by the bacteria, *Mycobacterium tuberculosis* is respiratory symptoms [3]. But TB presents itself in a variety of ways since it affects multiple systems. The respiratory system, gastrointestinal (GI) system, lymphoreticular system, skin, central nervous system, musculoskeletal system, reproductive system, and liver are the organ systems most frequently impacted [4,5]. In this case report, we describe a patient presenting with severe hyponatremia in the context of pulmonary tuberculosis.

A serum sodium content of less than 135 mEq/L is considered hyponatremia, albeit this definition may vary slightly depending on the standards used by different laboratories. A frequent electrolyte disorder known as hyponatremia is brought on by an excess of total body water in comparison to total body sodium concentration. A ratio imbalance known as hyponatremia occurs when the body's total water content exceeds its total solute content. The two primary compartments of total body water (TBW) are extracellular fluid (ECF), which makes up one-third, and intracellular fluid (ICF), which makes up the other two-thirds. ECF's

main solute is sodium, while ICF's main solute is potassium [6].

A Study in 1969 by Chung et al, demonstrated that 11% of patients with active TB had Hyponatremia and the main cause was SIADH [7]. Cockcroft et al., reported a 74-year-old woman with miliary tuberculosis which had been complicated by severe hyponatremia due to SIADH [8]. Lee et al reported an unusual case of PTB presenting as Hyponatremia with biochemical evidence of ectopic antidiuretic hormone production as a possible mechanism causing hyponatremia [9].

A few similar cases in the literature are described below (Table 2):

Study; Country; year	Demographic features	Past History	Duration of illness	Investigations	Treatment given
Miliary Tuberculosis Presenting with Hyponatremia and ARDS in an 82-Year-Old Immunocompetent Female; Spain; 2018 [10]	82 years Female	Type 2 Diabetes Mellitus, Atrial fibrillation	6 days	Normal physical examination, Initial blood sodium=123 mmol/dL, Normal chest x-ray, Chest CT with ground glass areas, Sputum culture showed M. TB.	Ciprofloxacin followed by Meropenem (Patient expired before the diagnosis was made)
Miliary tuberculosis presenting with hyponatremia and thrombocytopenia;Canada;1976 [8]	74 years Female	None	14 days	Chest x-ray suggestive of pulmonary congestion	isoniazid, rifampin, ethambutol, prednisone, vincristine and fluid restriction
A case of mild pulmonary tuberculosis complicated with the syndrome of inappropriate antidiuretic hormone secretion which caused impaired consciousness; Japan;2011 [11]	81 years Female	None	-	Chest x-ray suggestive of unilateral infiltration, Mycobacterium detected on sputum smear	Sodium loading with fluid restriction and anti-tubercular therapy

A case of pulmonary tuberculosis initially presented with syndrome of inappropriate secretion of antidiuretic hormone (SIADH);Japan;2003 [12]	90 years Male	None	-	Chest x-ray showed pulmonary infiltration, Mycobacterium detected on sputum smear	Sodium loading with fluid restriction and anti-tubercular therapy

Table 2: List of similar cases published in literature

The underlying pathophysiology of hyponatremia in pulmonary tuberculosis is likely multifactorial. Firstly, the pulmonary infection can lead to an excessive release of inflammatory cytokines, such as interleukin-6 and tumor necrosis factor-alpha, which may stimulate the secretion of antidiuretic hormone (ADH) from the posterior pituitary gland. The increased ADH levels result in impaired water excretion, leading to dilutional hyponatremia. Secondly, pulmonary tuberculosis can cause systemic inflammation and oxidative stress, which may affect the renal tubules' ability to regulate sodium and water balance. Additionally, tuberculous involvement of the central nervous system can disrupt the normal regulation of ADH release, further contributing to hyponatremia [13-15]. Patients with PTB who are older and have an increased CRP level are likely to have hyponatremia [16].

CONCLUSION:

In conclusion, we presented a case of a 74-year-old man with a history of pulmonary tuberculosis who showed signs of impaired consciousness, lower limb weakness, and severe hyponatremia. Mycobacterium tuberculosis was detected through GeneXpert. Our case indicates the significance of considering pulmonary tuberculosis as a possible cause of electrolyte imbalance. Particularly in regions where tuberculosis is endemic, healthcare professionals should not undervalue the link between pulmonary tuberculosis and electrolyte abnormalities. To avoid potential problems and improve patient outcomes, it is essential to identify and treat dyselectrolytemia in patients with respiratory symptoms. When dealing with electrolyte imbalances in cases presenting with these symptoms, healthcare providers should include tuberculosis in the differential diagnosis.

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CONFLICTS OF INTEREST:

None declared.

AUTHOR CONTRIBUTION:

All the authors contributed equally in drafting, editing, revising and finalizing the case report.

ETHICAL APPROVAL:

The ethical approval was not required for the case report as per the country's guidelines.

CONSENT:

Written informed consent was obtained from the patient to publish this report.

DATA AVAILABILITY STATEMENT:

The data that support the findings of this article are available from the corresponding author upon reasonable request.

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