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Dyspnea and Generalized Paresthesias Due to a Rare Metabolic Disorder: Severe Hypophosphatemia

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Abstract

We present a patient with severe hypophosphatemia related hypoxic respiratory failure resolving with phosphate replacement.

Keywords: Hypophosphataemia, dyspnea, generalized parasthesias

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Dear Editor,

Although known as an asymptomatic situation, hypophosphatemia may be life threatening in patients with severe phosphate depletion. Various clinical manifestations, such as diabetes mellitus, severe burns, severe respiratory alkalosis, alcohol withdrawal, malnutrition, and renal transplantation may cause severe hypophosphatemia [1]. Severe hypophosphatemia may cause acute respiratory failure in cases with or without chronic pulmonary disease [2,3]. However, the underlying mechanism is not wholly understood [4]. Here we present a patient with severe hypophosphatemia related hypoxic respiratory failure resolving with phosphate replacement.

A 35-year-old woman was admitted to the emergency room for progressive shortness of breath and paresthesias. The patient had a previous history of progressive dyspnea for one week but was otherwise healthy until the day of hospital admission. She did not smoke or drink alcohol. Her family history was unremarkable. On the same day she was admitted to the pulmonary care clinic because of dyspnea she was prescribed a salbutamol inhaler. However, a few hours later she was brought to the emergency room for progressive shortness of breath. On admission, her blood pressure was 145/90 mm Hg, pulse rate 132 beats/min, respiratory rate 28 breaths/min, temperature 36.8°C, and SpO_2 93%. Her height was 163 cm and her weight was 61 kg. Head and neck exam revealed no pathological findings, the chest examination was clear to auscultation, with normal breath sounds, and a cardiovascular exam revealed an accelerated rate with rare extrasystoles. The remainder of the physical was normal. Repeated neurological exam revealed normal cognitive function, normal cranial nerve and sensory functions and minimal to mild generalized diminished muscle strength. Oxygen supplementation was started with a non-rebreather mask, and SpO_2 was increased gradually within a few minutes. Initial laboratory tests could not determine the exact reason for her condition. Laboratory test results at the time of emergency room admission and consecutive results are summarized in Table 1. Moreover, her clinical status did not improve. She was then re-examined by another internal medicine specialist and a neurology specialist, but the underlying pathological condition was not diagnosed. Afterwards, rare metabolic disorders were suspected and investigated. The patient was finally diagnosed as having severe hypophosphatemia (1.11 mg/dl, normal range 2.7-4.5 mg/dl). A spot urine test was within the normal range. Sinus tachycardia with ventricular premature complexes and non-specific ST-T

changes were noted on electrocardiogram. No pathological finding was noticed on the chest radiograph. She was then referred to the intensive care unit and intravenous phosphate replacement therapy was initiated with potassium phosphate. Her dyspnea, tachypnea, tachycardia and paresthesias were gradually resolved over the next 6 hours. Serum phosphate level was 1.74 mg/dL three hours after administration of intravenous phosphate, and phosphate levels were progressively increased to the normal range. The patient became asymptomatic on the next day and remained healthy except for diarrhea. Serum phosphate remained within the normal range and the patient was discharged after 3 days. Since discharge she has been followed up as an outpatient.

Table 1. All laboratory results of the patient

Parameter	**Result**	**Normal Range**
Sodium (mEq/L)	137	136-145
Potasssium (mEq/L)	3.4	3.5-5.1
Chloride (mEq/L)	101	101-110
Magnesium (mg/dl)	1.8	1.6-2.6
Calcium (mg/dl)	10	8.4-10.2
Phosphorous (mg/dl)	1.11	2.7-4.5
Urea (mg/dl)	20.3	<50
Creatinine (mg/dl)	0.76	0.5-0.9
Leucocytes $x10^3/mm^3$	7.93	4.4–11.3
Hemoglobin (g/dl)	14.3	11.7-14.5
Glucose (mg/dl)	75	60-100
TSH (mIU/L)	0.45	0.27-4.20
Alkaline phosphatase (U/L)	75	35-104
25-Hydroxyvitamin D (ng/mL)	12.15	20-120
Parathormone (pg/mL)	22.37	15-65
Urinary Phosphorous (mg/24 h)	928.84	400-1300

Hypophosphatemia is responsible for various clinical consequences, such as cardiac, respiratory, neuromuscular, and hematological disorders, which are closely associated with morbidity and potential mortality [5]. Previously, respiratory failure has been depicted in severely hypophosphatemic patients, attributed to ventilatory dysfunction [3-5]. Phosphate is an essential component of adenosine tri-phosphate (ATP). In case of severe hypophosphatemia, decreased levels of ATP for respiratory muscle contraction may be responsible for the onset of acute respiratory insufficiency [3-5]. In emergency services, respiratory failure is a frequent medical problem, however, hypophosphatemia associated respiratory failure is an infrequent condition and may easily be under-diagnosed.

We have presented a rare case of a severely hypophosphatemic young female with acute respiratory failure, with rapid resolution of the clinical picture associated with controlled correction of hypophosphatemia. In case of a non-ventilatory type of respiratory dysfunction, physicians should be aware of the possibility of severe hypophosphatemia. Further investigations should be performed to clarify the exact mechanisms of hypophosphatemia-associated hypoxemia.

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