

Letter to the Editor

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Phosphate metabolism and respiratory alkalosis: a forgotten lesson in COVID-19

Sir,

Electrolyte abnormalities are common in frail older adults presenting to hospital, and are independently associated with mortality [1]. Phosphate homeostasis is crucial for not only bone mineralisation, but also cellular signalling and metabolism [2]. Hypophosphatemia and hypokalaemia are the primary electrolyte abnormalities associated with the 'refeeding syndrome' and this is a common clinical problem in older adults. Whilst the anabolic drive of phosphate intracellularly is well described in refeeding syndrome [2], it is important to remember other causes of deranged phosphate that may be seen in older adults.

Malabsorption and increased losses from either the gastrointestinal tract or renally are common causes of hypophosphatemia; however, other causes are often overlooked. Importantly, hyperventilation (in mechanically ventilated or spontaneously breathing patients) leads to a respiratory alkalosis and corresponding increase in intracellular pH [2]. This subsequently leads to increased phosphofructokinase activity and glycolysis in general, resulting in increased demand for phosphate intracellularly and a corresponding fall in extracellular phosphate [3].

This is an important mechanism to remember in the current COVID-19 pandemic, which has seen health services worldwide placed under strain with very large numbers of patients presenting with respiratory failure—many of whom are older, co-morbid, adults [4]. Many patients with COVID-19 will experience a period of compensatory hyperventilation and associated respiratory alkalosis prior to decompensation and subsequent respiratory failure [5]. Whilst, hypophosphatemia will frequently be multifactorial in this population, it is important for the geriatrician to

remember that some hypophosphatemia may be explained by respiratory disease and may correct with improving respiratory function. This is especially important considering the burden of polypharmacy already faced by this population and recent concerns over the availability of some phosphate preparations commonly used in hospital.

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References

1. Sumukadas D, Jenkinson F, Witham MD. Associations and consequences of hypophosphatemia in older hospitalised women. *Age Ageing* 2009; 38: 112–4.
2. Wadsworth R, Siddiqui S. Phosphate homeostasis in critical care. *BJA Educ* 2016; 16: 305–9.
3. Datta BN, Stone MD. Hyperventilation and hypophosphatemia. *Ann Clin Biochem* 2009; 46: 170–1.
4. Docherty AB, Harrison EM, Green CA *et al.* Features of 20 133 UK patients in hospital with covid-19 using the ISARIC WHO clinical characterisation protocol: prospective observational cohort study. *BMJ* 2020; 369. doi: [10.1136/bmj.m1985](https://doi.org/10.1136/bmj.m1985).
5. Ottestad W, Søvik S. COVID-19 patients with respiratory failure: what can we learn from aviation medicine? *Br J Anaesth* 2020. doi: [10.1016/j.bja.2020.04.012](https://doi.org/10.1016/j.bja.2020.04.012).

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