ADVANCED INSTRUMENTS

SCIENTIFIC RESOURCE

# USING OSMOLALITY TO DIAGNOSE AND TREAT HYPONATREMIA IN COVID-19 PATIENTS


## ARTICLE SUMMARY

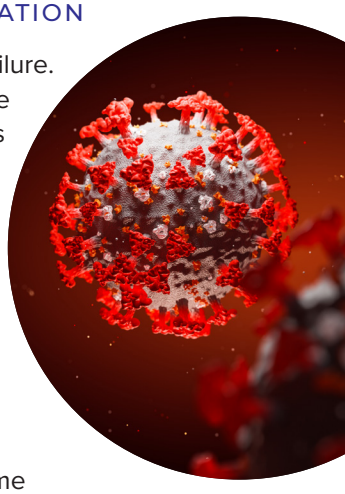
Recent publications have shown that COVID-19 (coronavirus disease 2019), an infectious disease caused by a novel coronavirus known as severe acute respiratory syndrome coronavirus (SARS-CoV-2), is associated with electrolyte disorders including hyponatremia.[1,2,3] Early diagnosis and etiologic determination are critical in any hyponatremic patient to ensure proper treatment and to avoid potential harm to the patient.[4,5] Osmolality testing is quick, inexpensive and effective to help with early detection and diagnosis of hyponatremia.[6] Osmolality testing can help ensure that appropriate treatment strategies are implemented early for hyponatremic patients which may be even more significant in patients hospitalized with COVID-19.[5,7,8] As clinicians and researchers continue to expand their understanding of COVID-19, additional laboratory testing is important to consider to help better understand and diagnose a COVID-19 patient's underlying conditions.


## OSMOLALITY TESTING CAN HELP WITH EARLY DIAGNOSIS AND ETIOLOGICAL DETERMINATION OF HYPONATREMIA, WHICH IS CRITICAL FOR THIS PATIENT POPULATION

As association between COVID-19 and hyponatremia has been shown in the literature.[1,2,3] Hyponatremia is an electrolyte disorder that occurs when the concentration of sodium in the blood is abnormally low and osmolality is an important tool used to detect and diagnose this condition.[4]

The etiology of hyponatremia is likely multifactorial and can vary among patients presenting with COVID-19. Early diagnosis and etiologic determination are crucial in any hyponatremic patient due to differences in treatment approach. An incorrect etiologic diagnosis of the underlying cause of hyponatremia in hospitalized patients can lead to inappropriate treatment, resulting in increased morbidity, ICU admissions, and length of stay.[5,8] **Osmolality** is a fundamental measurement of the total solute concentration of body fluids, including but not limited to, whole blood, serum, plasma, urine and stool. Serum and urine osmolality are integral to the diagnosis and management of hyponatremia. The use of **urine osmolality** to establish a correct underlying diagnosis of hyponatremia is critical to avoid inappropriate treatment and potential harm to the patient.[4,6,9] Ensuring that appropriate treatment strategies are implemented may be even more significant in patients hospitalized with COVID-19, as inappropriate fluid resuscitation has been associated with increased respiratory complications.[5,9,10]

Hyponatremia in patients with COVID-19 is often due to increased release of a water retaining hormone, antidiuretic hormone (ADH), which dilutes sodium in the blood, but the etiology of increased ADH dictates management. Volume depletion due to gastrointestinal fluid losses, including vomiting, diarrhea, and poor oral intake, common in patients with COVID-19, can drive the need for fluid retention, and thus an increased release of ADH. Alternatively, a syndrome of inappropriate ADH release (SIADH) can occur in response to numerous comorbidities caused by COVID-19, including stroke, pneumonia and respiratory failure. Understanding the underlying causes of hyponatremia is important because the treatment options vary widely from fluid resuscitation for hyponatremia driven by volume depletion to volume restriction for hyponatremia driven by SIADH.[4,9] **Urine osmolality** is essential and instrumental in differentiating such etiologies of hyponatremia, which require treatment and fluid management that is specific to the underlying pathophysiology to ensure proper treatment.[6,9] Understanding this etiology is of even greater importance with COVID-19 patients because they require cautious and conservative fluid resuscitation to avoid exacerbating underlying respiratory distress and pulmonary inflammation.[8,10]



## CONCLUSION

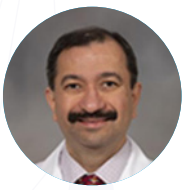
Recent literature has shown an association between COVID-19 and hyponatremia. Osmolality testing should be used to establish a correct underlying diagnosis of hyponatremia, which is critical to avoid inappropriate treatment and potential harm to the patient. An incorrect etiologic diagnosis of hyponatremia in hospitalized patients can lead to inappropriate treatment, resulting in increased morbidity, ICU admissions, and length of stay. Expansion of osmolality testing, a fast and inexpensive test, across the COVID-19 patient population may be helpful in early diagnosis and treatment of this underlying electrolyte disorder.

## THE UTILITY OF OSMOLALITY TESTING WITH HYPONATREMIA: TWO PHYSICIANS' PERSPECTIVES

Two physicians partnered with Advanced Instruments to share their experiences regarding the utility of osmolality testing as a valuable clinical tool in the diagnosis and treatment of patients with hyponatremia.[11]

### Namrata Goel, M.D. is a Nephrologist at the Kidney Health Center in Houston Texas

"Serum osmolality, urine osmolality, and urine sodium are the initial lab tests that I order when I am first asked to consult on a patient with hyponatremia. Serum osmolality helps me differentiate hypotonic hyponatremia from iso-osmolar and/or hyperosmolar hyponatremia (from hyperglycemia, mannitol, hyperlipidemia or hyperproteinemia). In the later cases of "pseudo-hyponatremia," you will find a normal or high serum osmolality with a falsely low measured serum sodium. Furthermore, urine osmolality can be used to distinguish between impaired water excretion, or Syndrome of Inappropriate Antidiuretic hormone secretion) (SIADH), and hyponatremia with normal water excretion. Once a diagnosis of "true hyponatremia" has been established by low serum osmolality, I then use the urine sodium to differentiate between cases of hypovolemia, euvolemic, and hypervolemia. Based on the results from the urine sodium and the history and physical of the patient, I then make my treatment decision. If the patient has peripheral edema or fluid overload, they may be treated with diuretics and/or fluid restriction. Whereas, if the patient has a urine osmolality > 150 mOsm/kg, they potentially have SIADH and because the body is retaining water, the patient may be fluid restricted, and not given any saline fluids. The risk of not ordering both serum osmolality and urine osmolality may lead to treating the electrolyte abnormality such as hyponatremia incorrectly, which can harm the patient. Most commonly, the patient will be getting IV fluids even in cases of "pseudohyponatremia" when there is a false reading of low sodium in hyper-proteinemia, hyperlipidemia, or after surgery using high osmotic agents. In addition, cases of SIADH can be missed if a urine osmolality is not ordered. In this condition, the body retains water instead of excreting it normally in urine, so the urine osmolality will be very high. Saline IV fluids given in a patient with SIADH will only lower the sodium level more or keep it unchanged and the patient's condition will not improve or may get worse. Both hyponatremia at admission and hospital-acquired hyponatremia result in increases in ICU admissions and hospital readmissions, as well as a greater utilization of healthcare resources. Ordering serum and/or urine osmolality upfront as the first tests a physician orders in hyponatremia will reduce the length of stay of a patient in the hospital. A reduced length of stay per patient with hyponatremia will reduce the cost of care as well as fewer ICU days. This is because the serum and urine osmolality give the physician the vital information on the diagnosis of the hyponatremia. If the physician knows the diagnosis on the initial day of admission, then the precise treatment begins the same day and the patient will be out of the ICU or discharged earlier when stable. Commonly, I am consulted on a hyponatremic patient in the ICU after the patient has been receiving saline IV fluids for hyponatremia for 2 days with no change in the serum sodium level, which happens because osmolality was not ordered. Once I get consulted as a Nephrologist, I order the serum and urine osmolality and may discover that the patient has SIADH and should be off IV saline, and rather be fluid restricted. Thus, not ordering serum and urine osmolality may lead to the wrong treatment plan and thus a longer length of patient stay, higher hospital cost, and risk to patient health. In my experience, osmolality testing on the first day would reduce the number of days in the hospital by a day or more."



### Neville R. Dossabhoy, M.D. is a consulting nephrologist in Louisiana

"Measurement of the plasma osmolality is crucial to making the correct diagnosis in patients with hyponatremia. The possibilities are completely different - and so is the proper treatment – depending on whether osmolality is low, normal, or high. It would be very easy to make the wrong diagnosis if the osmolality were not measured or not available, and thereby end up giving the wrong treatment to the patient. Not only would that be potentially harmful to the patient; but also, very expensive, given that some of the medications now available to treat SIADH (one of the causes of hyponatremia) cost literally USD 500-1000 per day! Just one or two misdiagnosed patients can cost the hospital system as much as the price of the osmometer! This is not counting the possible costs arising from litigation for malpractice by misdiagnosis and improper treatment."

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[11]To reference these physician's notes on our website, please visit www.aicompanies.com/education/.



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