

Hyponatremia, Prevalence, Diagnosis, and Management

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Hyponatremia, defined as serum sodium less than 135 mEq/l, is the most prevalent electrolyte abnormalities both in inpatient and outpatient setting.¹ Many of them are asymptomatic, but worsening hyponatremia or severe hyponatremia can be a devastating complication.^{2,3} Even asymptomatic, it was reported that mild hyponatremia has been linked to fractures because of the increased risk of falling or decreased bone mineral density.⁴ Severe hyponatremia can cause an osmotic shift of water from plasma into the brain cells which cause clinical manifestations such as confusion, diminished reflexes, convulsions, stupor, or coma.⁵ This severe complication can also happen as an effect of too rapid hyponatremia correction.^{3,5,6}

The reported frequency of the disorder is vary, determined by a number of factors, including the definition of hyponatremia, frequency of testing, the healthcare setting, and the patient population.⁷ On a large Singaporean study found that 28.2% of acute care hospital patients experience at least 1 episode of hyponatremia, as do 21% of ambulatory care (outpatient) hospital patients and 7.2% of patients in community care (polyclinics).⁸ Among general acute care patients, the prevalence of hyponatremia is estimated to be approximately 1%. However, much higher rates ranging from 18% to 30% have been observed among elderly nursing home residents and in intensive care settings. In hospital inpatients, ward or ICU, the prevalence is highest, usually found with other diseases or conditions. Since hyponatremia patients were seen more in acute care hospital, particular attention should be given to admission versus hospital-acquired hyponatremia.⁷

The present paper⁹ discusses the incidence of acute and chronic hyponatremia in hospital regarding their age. In this one hospital report, hyponatremia is more common in older age, as they possibly already have more risk factors and comorbidities. Aging is associated

with a decreased capacity to cope with environmental, disease-related, and iatrogenic (especially drug-related) stresses in sodium and water balance.⁸

Management of hyponatremia should start with comprehensive clinical assessment, history of patient's previous diseases, conditions, risk factors, such as drugs used, physical examination (signs of volume depletion or not) and laboratory test for plasma osmolality (plasma sodium) and urinary sodium concentration.³

Hyponatremia indicates a relatively greater amount of water to sodium in the plasma. There are several types of hyponatremia, the most commonly encountered dysnatremia in hospitalized patients is euvolemic hyponatremia. Other types are hypovolemic hyponatremia and hypervolemic hyponatremia.¹

Causes of euvolemic hyponatremia included, diuretic mostly hydrochlorothiazide (HCT), drug induced such as selective serotonin reuptake inhibitors (SRSI), intra venous immune globulin (IVIG), user of MDMA (3,4-methylene dioxy methamphetamine) known as ecstasy who hydrates excessively, hypothyroidism, postoperative due to electrolyte-free infusion, glucocorticoid deficiency, exercise induced or long-distance runner, and the syndrome of inappropriate antidiuretic hormone (SIADH) secretion.^{3,7} This syndrome is diagnosis of exclusion which antidiuretic hormone causes water retention, so hyponatremia then occurs as a result of inappropriately increased water retention in the presence of sodium loss. Many diseases, drugs, or conditions can cause SIADH.

Hypervolemic hyponatremia occurred when total body sodium concentration and water increased, but total body water increased more. This is usually associated with a variety of conditions, including congestive heart failure, advanced cirrhosis, nephrotic syndrome, and renal failure.³ Decreased plasma sodium concentration is a predictor for poor survival

in patients with cardiac failure and cirrhosis.

Another type is hypovolemic hyponatremia, which has both total body sodium and a water deficit, with the sodium deficit exceeding the water deficit. This occurs in patients with high gastrointestinal and renal losses of water and solute accompanied by free water or hypotonic fluid intake. The underlying mechanism is the non-osmotic release of vasopressin stimulated by volume contraction, which maintains vasopressin secretion despite the hypotonic state.

As hyponatremia can arise in all fluid states such as euvolemic, hypovolemic, and hypervolemic conditions, many clinicians may not recognize its presence. Recognizing risk factors, diseases, drugs, and conditions which causes or relates to hyponatremia is important. For inpatients management, frequent monitoring of plasma sodium and early intervention if plasma sodium decreases to less than 136 mEq/L. Many of complicated severe hyponatremia in hospital can be more prevented by early recognition and management of hyponatremia.

The treatment of hyponatremia in acute illness depends on the correct diagnosis. Unfortunately, occasionally a physician believes that all types of hyponatremia means a decrease in total body sodium concentration and therefore the treatment is isotonic saline administration.⁵ Isotonic saline is often not effective and may be worsen the hyponatremia in SIADH.¹⁰

Other problem is incorrect management which can lead to significant morbidity and mortality. It can be whether late to start treatment or too rapid correction. To prevent these situations physicians have to use appropriate treatment guidelines for hyponatremia.

There are important factors to consider when deciding on treatment; the rapidity of onset of hyponatremia the degree, duration, and symptomatology of hyponatremia, the presence or absence of risk factors for neurologic complications.¹¹ Generally in acute conditions, severe symptomatic hyponatremia is best treated by slowly raising the patient's serum sodium level, most experts agree that the rate should be no more than 10-12 mEq/L per day. Faster rates are implicated in the rare but serious complication of central pontine myelinosis. Hypertonic saline should be given for hyponatremia patients with seizures, coma, or new focal neurologic findings and whose serum sodium level is less than 120 mEq/L until the cessation of life-threatening manifestations, moderation of other symptoms, or the achievement of a serum sodium concentration of 125 to 130 mEq/L.^{5,6} Infusion of

hypertonic saline (3%) at a rate of 1-2 mEq/kg/hour and addition of loop diuretic to enhance water excretion is recommended to achieve this goal.

In chronic and asymptomatic hyponatremia, removing underlying conditions, water restrictions less than 800 ml/day or 1-1.5 liters, in hypervolemia is sufficient. Loop diuretic can be used to relax of fluid restriction. This is the mainstay of long term treatment. In the SIADH, but not in edematous disorders, loop diuretics should be combined with plentiful sodium intake.^{4,5}

A new development relating to hyponatremia is new agents that promote aquaresis in patients with hyponatremia by targeting V1a receptors in the vascular smooth muscle, V2 receptors in the kidney, or both. Arginine vasopressin (AVP) receptor antagonists is now approved for the treatment of euvolemic hyponatremia patients. This aquaretic based correction can avoid the unpredictable effects of volume restriction and saline repletion.¹¹ In general, AVP receptor antagonists show promise as an effective and tolerable treatments for patients with hyponatremia.⁵ It is likely they will become a mainstay of treatment for euvolemic hyponatremia.¹²

As hyponatremia is prevalent condition in hospital which can develop to serious complications, it is important for physician to give more attention in recognizing and managing it as in guideline. There is some progress in managing chronic hyponatremia with AVP receptor antagonists.

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