Severe Hyponatremia in hospitalised adults at Sultan Qaboos University Hospital

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Abstract

Objective: To see the frequency of severe hyponatremia in hospitalised cases and correlate it with etiology and outcome.

Methods: Adult inpatients in 1998 at Sultan Qaboos University Hospital with serum sodium <125 mmol/l were identified through the computerized hospital information system and studied retrospectively. Pseudohyponatremia and where hyponatremia due to laboratory error were excluded. Demographic, clinical, laboratory data and treatment and out come were recorded.

Results: There were a total of 11632 adult admissions with 149 deaths (1.28%). A total of 35 patients (age range 18 to 75 years) fulfilled the inclusion criteria. Major comorbid conditions were congestive heart failure (34.2%), diabetes mellitus (31.4%), surgical or obstetrical procedure(22.8%), hypertension (17.1%), malignancy (11.4%), pneumonia (8.5%), cerebrovascular disorder (8.5%), cirrhosis (8.5%) and nephrotic syndrome (2.85%). Volume status was determined as euvolemic (48.5%), overloaded (42.8%) and dehydrated (8.5%). The etiology was iatrogenic in (62.8%) with major iatrogenic factors being diuretics (37.1%), hypotonic fluids (22.8%) and antidiuretic hormone analogs (2.85%). Common symptoms included nausea and vomiting (51.42%), followed by irritability (14.2%). No seizures or long term neurological sequelae were noted. Treatment included isotonic fluids (31.4%) and fluid restriction (11.4%). Six out of 35 patients died (17.1%) compared to 1.28% in general inpatients; a figure thirteen times higher.

Conclusion: Severe hyponatremia is observed in hospitalised patients with significant comorbid conditions and is associated with significantly higher mortality when compared to non-hyponatremic patients. Further prospective studies are required to determine the differences noted in presentations and outcome in comparison to previously published reports (JPMA 53:180;2003).

Introduction

Hyponatremia is one of the most common electrolyte disorders, the frequency ranges from 1% to 40% from general hospital populations.[1-3] The frequency varies within different specialties in the same hospital, degree of hyponatremia, i.e., <135 mmol/l, <130 mmol/l, <125 mmol/l or <120 mmol/l studied and from hospital to hospital according to the patient groups they serve.[4-9] Data from Middle Eastern countries is limited, especially in general inpatients.[10]

Patients and Methods

We retrospectively studied the presence of significant hyponatremia (serum sodium <125 mmol/l) in adult general inpatients at Sultan Qaboos University Hospital from first of January to 31st of December 1998. The patients were identified through the computerised hospital information system. Patients with pseudohyponatremia (hyponatremia associated with normal or high serum osmolality) and in whom hyponatremia was considered a laboratory error (repeat sodium more than 135 mmol/l within six hours without intervention) were excluded. Charts were reviewed and demographic, clinical, laboratory data, treatment and outcome were recorded. Patients were labelled hypervolemic if a raised jugular venous prssure and edema was recorded along with the use of diuretics. Patients were labelled to be hydrated if they were hypotensive and/or clinical signs of dehydration such as poor skin turgor or dry mucus membranes were recorded. Patiens were considered to be euvolemic if they could not be identified as hypervolemic or hypovolemic. The etiology was labelled as iatrogenic if patients were on diuretics or hypotonic fluids or were treated with drugs known to cause hyponatremia.

Results

A total of 35 patients (20 male, 15 female; age range 18 to 75 years) fulfilled the inclusion criteria. Thirteen cases were excluded due to pseudohyponatremia, laboratory error and unavailable charts.

Major comorbid conditions noted were congestive heart failure 12 (34.2%), diabetes mellitus 11 (31.4%), surgical or obstetrical procedure 8 (22.8%), hypertension 6 (17.1%), malignancy 4 (11.4%), pneumonia 3 (8.5%), cerebrovascular disorder 3 (8.5%), cirrhosis 3 (8.5%) and nephrotic syndrome 1 (2.85%). Patients were labelled hypervolemic if a raised jugular venous pressure and edema was recorded along with the use of diuretics. Patients were labelled to be dehydrated if they were hypotensive and/or clinical signs of dehydration such as poor skin turgor or dry mucus membranes were recorded. Patients were considered to be euvolemic if they could not be identified as hypervolemic or hypovolemic. Volume status was euvolemic 17 (48.5%), hypervolemic 15 (42.8%) and dehydrated 3 (8.5%). The etiology was iatrogenic if patients were on diuretics or hypotonic fluids or were treated with drugs known to cause hyponatremia. The etiology was determined to be iatrogenic in 22 (62.8%). The major iatrogenic factors were diuretics 13 (37.1%), hypotonic fluids 8 (22.8%) and antidiuretic hormone analogs 1 (2.85%). Common symptoms included nausea and vomiting (51.42%), followed by irritability (14.2%). No seizures or long term neurological sequelae were noted. Treatment included isotonic fluids 11 (31.4%) and fluid restriction 4 (11.4%). None of the patients were treated with hypertonic fluids. Mortality in patients with severe hyponatremia was 17.1% (6 out of 35) compared to 1.28% (149 out of 11635) in general inpatients; a figure thirteen times higher.

Discussion

Although isolated hyponatremia is uncommon, severe hyponatremia in association with other diseases is not uncommon in hospitalised adult patients.. When present, it heralds a poor prognosis in general. In our series we found congestive cardiac failure to be the most common comorbid condition. In such patients hyponatremia may be a reflection of severe disease and in itself may not be directly responsible for increased mortality. Outcome of ischemic or dilated cardiomyopathy[11-13] and myocardial infarction[14] is poor if associated with hyponatremia. Presence of hyponatremia also predicts early readmission in patients with heart failure.[15] Because of its strong predictive value of poor survival, hyponatremia could aid in triaging of patients with heart failure to earlier cardiac transplantation.[11] Diabetes mellitus was the second commonest comorbidity, despite the correction of hyponatremia for the degree of hyperglycemia. It is perhaps not surprising as many of the patients with diabetes mellitus had co-existing hypertension, heart failure and/or cerebrovascular disease. Surgical and obstetrical procedures accounted for 22.8% of cases of severe hyponatremia. Perioperative hyponatremia is considered to be related to the use of hypotonic fluids, stress-related vasopressin release and possibly as an acute phase response and decreased serum albumin levels.[15] Use of Oxytocin to induce labor may contribute to hyponatremia in obstetrical cases. Diuretics play a major role in the development of hyponatremia in patients with heart failure, cirrhosis, nephrotic syndrome and hypertension. Hyponatremia develops more commonly with thiazide diuretics rather than loop diuretics. Optimal treatment of diuretic-induced hyponatremia remains unclear.[16] Hyponatremia in patients with cirrhosis and hepatic failure[17,18] and pneumonia[19,20] is a predictor of poor outcome. Similarly mortality is higher in hyponatremic patients with malignancies when compared to those who do not have hyponatremia.[1]

Symptoms depend upon the rapidity of development of hyponatremia. Most of these symptoms are related to the excitable tissues, such as the nervous system and muscles. Slow development of hyponatremia allows time for the brain cells to adapt to the changing osmolality by loss of intracellular osmoles. Usual symptoms include confusion, hallucinations, tremors, and intellectual impairment without clouding of consciousness, acute psychosis, hemiparesis, seizures and coma. In our patients nausea, vomiting and irritability were seen but no seizures were noted perhaps due to relatively slower development of hyponatremia.

Asymptomatic or chronic hyponatremia should be treated gradually. Aggressive management with a sudden rise in serum sodium may result in development of fatal neurological complication of Osmotic demyelination syndrome (or Central Pontine myelinolysis).[21,22] Clinically this disease is characterized by an initial improvement of the neurological findings after treatment of hyponatremia. This initial improvement is followed by worsening over several days. Patient may develop signs of upper motor neuron lesions, spastic quadriparesis, pseudobulbar palsy, confusion and coma. Risk factors for development of osmotic demyelination syndrome include history of alcoholism, hyponatremia developing in liver transplant patients[22], concomitant presence of hypokalemia[23] and rapid (>12 mmol/1/24 hours) correction. Some authorities believe this complication of hyponatremia and its treatment to be more common in females.[24,25] Brain imaging with CT scan may, at times, not reveal the lesions for up to two weeks. Magnetic Resonance Imaging appears to be superior diagnostic tool for antemortem diagnosis of osmotic demyelination syndrome. The outcome osmotic demyelination syndrome was considered to be poor in general but recent studies suggest a better prognosis than what was previously thought.[26] Additionally, the final neurological outcome does not appear to depend

on the severity of neurological deficits during the acute phase, degree of hyponatremia, or concomitant internal disease.[27] The treatment is supportive and outcome may be improved if secondary complications such as aspiration pneumonia, ascending urinary tract infections with subsequent septicemia, deep venous thrombosis and pulmonary embolism can be avoided. Most importantly the disease may be prevented if rapid correction of chronic hyponatremia is avoided.[28,29] Sterns and colleagues did not observe any neurologic complications if serum sodium was corrected by <12 mmol/l per 24 h or by <18 mmol/l per 48 h or in whom the average rate of correction to a serum sodium of 120 mmol/l was < or = 0.55 mmol/l per hour.[29] The risk of osmotic demyelination may be further reduced if coexisting hypokalemia is corrected before correction of serum sodium. In acutely developing and symptomatic hyponatremia the risk of rapid correction and consequences of rapidly developing hyponatremia must be weighed and treatment may be individualized.

Mortality in our series in patients with severe huponatremia was 17.1% (thireen times higher than the overall mortality). Anderson and associates found that 1%of hospitalised patients and 4.4% of postoperative patients had hyponatremia (serum sodium level below 130 mmol/l) but none of the patients in their series had brain damage. However, hyponatremia was associated with a 60-fold increase in mortality, which was usually due to associated medical conditions.[9]

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