An Observational Study of Hyponatremia in ICU Patients in a Tertiary Care Hospital of Ahmedabad

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Abstract :

Introduction: Hyponatremia is defined as serum sodium level <135meq/L. It is the most common electrolyte abnormality seen in hospital admissions worldwide. **Objectives:** To determine the incidence, etiology, clinical profile of hyponatremia in patients requiring medical ICU admission and to Correlate the hyponatremia with serum uric acid level. **Material and Methods:** This was an observational, cross sectional study in tertiary care GCS medical college and hospital. In which, total 408 ICU admissions were screened for hyponatremia over two months period.Out of which, 46 patients satisfied the inclusion criteria. Two cases were excluded in view of pseudohyponatremia. Therefore, total 44 patients were included in study. **Results:** In this study, total 408 patients were screened and 44 patients (10.78%)of total ICU admissions had true hyponatremia.Different symptoms attributed to hyponatremia included nausea(59.09%), headache (18.18%), drowsiness (18.08%), altered sensorium(13.63%) and convulsion(4.50%). SIADH (Syndrome of inappropriate antidiuretic hormone secretion) criteria was met in 20 patients, being the leading cause of hyponatremia. Hypervolemic hyponatremia was found in 14 patients whereas hypovolemic hyponatremia in 10 patients. In SIADH, 70% patients had Hypouricemia (p value 0.001) whereas in Hypervolemic hyponatremia 85.71% had hyperuricemia (p value 0.001). Overall mortality in hyponatremic group was 18.18%. **Conclusion:** Most common cause of hyponatremia found in ICU patients was SIADH. Nausea was the most common symptom and convulsion was the least common symptom in hyponatremic group. Most of SIADH patients had Hypouricemia and Hypervolemic patients had hyperuricemia.

Key Words : Hyperuricemia, Hyponatremia, SIADH

Introduction :

Hyponatremia defined as plasma sodium level <135 meq/L. Sodium ion is the major extracellular fluid particle. It is the most common electrolyte abnormality seen in hospital admissions worldwide.[1] The proportion is even higher in the intensive care unit (ICU) setting. Prevalence of hyponatremia in hospital admissions varies between 3.4% to 39.4%. [2-4] Disorders of serum sodium concentration are caused by abnormalities in water homeostasis, leading to changes in relative ration of sodium to body water. Water intake and circulating arginine vasopressin (AVP) constitute the two key effectors in the defense of serum osmolality; defects in one or both of these two defense mechanisms cause most cases of hyponatremia and hypernatremia. Assessment of the volume status is helpful in determining the type of hyponatremia as it occurs because of a relatively greater amount of total body water as compared with total body solute.[5]

It is important to rule out pseudohyponatremia secondary to hyperglycemia and hyperlipidemia. Hypovolemic hyponatremia is associated with clinical symptoms and signs of volume depletion. Hyponatremia without signs of volume depletion or overload is classified as euvolemic hyponatremia. Patients with clinically detected increased extracellular fluid (ECF) volume are classified as hypervolemic hyponatremia.[6] Serum sodium, urinary sodium, serum and urinary osmolality are the basic important investigations needed to arrive at the etiology of hyponatremia. SIADH is the commonest cause of euvolemic hyponatremia among different studies.

Aims and Objectives:

-To determine incidence of hyponatremia in total number of ICU admissions.

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-To define etiology and clinical profile of hyponatremia in patients with ICU admission

-To study correlation of serum uric acid level in hypovolemic, euvolemic and hypervolemic hyponatremic patients.

Material and Methods:

This was an observational, cross sectional study in tertiary care GCS medical college and hospital. In this study, total 408 ICU admissions patients were screened for hyponatremia over a period of two months. In which, 46 patients satisfied the inclusion criteria. 2 cases were excluded in view of pseudohyponatremia. Serum sodium level, urinary sodium level and serum osmolality were studied in all the ICU admissions. Serum uric acid level was studied in all Hyponatremic ICU patients. We also focused on patient's cardiac function, renal function, liver function status to rule out acute kidney injury (AKI) or chronic kidney disease (CKD), congestive heart failure and hepatic failure. For above mentioned conditions, we did investigations such as serum creatinine, two-dimensional echocardiography (2DEcho), liver function tests (LFT). We studied serum uric acid correlation with different type of hyponatremia. Outcome was studied in terms of mortality.

Inclusion Criteria: To take those patients into considerations:

-who have been admitted in the ICU.

-who have serum sodium <135meq/l.

-age greater than 18 years.

Exclusion Criteria:

-Those who don't have hyponatremia.

-Age less than 18years.

All necessary investigations to diagnose the condition were carried out as and when needed.

Results:

In our study, total 408 patients were studied and 44 patients (10.78%) of total ICU admissions had true hyponatremia.As shown in the table 1, different symptoms attributed to hyponatremia included nausea 59.09% (26 cases), headache 18.18%(8 cases), drowsiness 18.08% (8 cases), altered sensorium 13.63%(6 cases) and convulsion 4.50% (2 cases). The study showed distribution among three types of hyponatremia as euvolemic hyponatremia in 45.45% (20 cases), hypervolemic hyponatremia in 31.81% (14 cases) and hypovolemic hyponatremia in 22.72% (10 cases) [Table 2]. The most common cause of euvolemic hyponatremia is SIADH. In SIADH, 70% patients had Hypouricemia (p value 0.001) whereas in Hypervolemia 85.71% had hyperuricemia (p value 0.001) [Table 3]. Overall mortality in hyponatremia group was 18.18%.

Table 1: Proportion of different symptoms of Hyponatremia in Patients

Types	Cases(n=44)	% of cases
Nausea	26	59.09
Headache	08	18.18
Drowsiness	08	18.18
Altered sensorium	06	13.63
Convulsion	02	4.54

Table 2: Proportion of different types of Hyponatremia in Patients

Types	Cases(n=44)	% of cases
Euvolemic hyponatremia (SIADH)	20	45.45
Hypervolemic Hyponatremia	14	31.81
Hypovolemic Hyponatremia	10	22.72

Table 3: Proportion of Hypouricemia and Hyperuricemia indifferent types of Hyponatremia Patients

Types	Total Cases	% of cases
Euvolemic Hyponatremia (SIADH) hypouricemia	14 (n=20)	70
Hypervolemic Hyponatremia hyperuricemia	12 (n=14)	85.71
Hypovolemic Hyponatremia hypouricemia	06 (n=10)	60

Discussion:

In our study, the frequency of hyponatremia was 10.78% of all ICU admission during study period. In Rajesh Padhi et al. study[7], the frequency of hyponatremia on ICU admission was 34.3% whereas in

Kanchana Pillai et al.study[8], 5.2% of total ICU admissions had hyponatremia.

The most common presenting complaint in our study was nausea (59.09%), similar to kanchana pillai et al. study [8] in which nausea comprised a major complaint.

In our study, SIADH is the most common cause of hyponatremia. Rajesh Padhi et al.[7] and kanchana Pillai et al.[8] also found similar results.The generation of hyponatremia in SIADH requires an intake of free water, with persistent intake at serum osmolalities that are lower than the usual threshold for thirst.[9] Hypervolemic included congestive heart failure, AKI, CKD and liver cirrhosis. Patients with hypervolemic hyponatremia develop an increase in total-body salt (Na^+-Cl^-) that is accompanied by a proportionately greater increase in total-body water, leading to a reduced plasma Na^+ concentration. Hyponatremia induces generalized cellular swelling, a consequence of water movement down the osmotic gradient from the hypotonic extracellular fluid (ECF) to the intracellular fluid (ICF). [9] Causes of hypovolemic hyponatremia included diarrhoea, thiazide induced, cerebral salt wasting, salt losing nephropathy. Hypovolemia causes marked neurohumoral activation, increasing circulating levels of AVP. The increase in circulating AVP helps preserve blood pressure via vascular and baroreceptor V1A receptors and increases water reabsorption via renal V2 receptors; activation of V2 receptors can lead to hyponatremia in the setting of increased free water intake.[9]

Measurement of serum uric acid were also performed; whereas patients with SIAD-type physiology will typically be hypouricemic (serum uric acid <4 mg/dl), volume-depleted patients will often be hyperuricemia.[9] In this view, we concluded the similar results, hypouricemia was common in SIADH as opposed to hyperuricemia in Hypervolemic hyponatremia. Overall mortality in hyponatremic group was 18.18%. Rajesh Padhaiet al.[7] also found an increased mortality in hyponatremic groups.

Treatment approach to hyponatremia depends on the type of hyponatremia. Patients with hypovolemic hyponatremia mainly treated by repleting the ECF volume with Normal Saline (NS). Water restriction and 3% saline are the mainstay of treatment of euvolemic and hypervolemic hyponatremia.[9]

Conclusion:

Hyponatremia is a frequent finding in critical ill patients. Most common cause of hyponatremia in ICU patients was euvolemic hyponatremia. Nausea was the most common and convulsion was the least common symptom in hyponatremic group. Most of SIADH patients had Hypouricemia and Hypervolemic patients had hyperuricemia.

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