TO STUDY THE CLINICAL OUTCOME OF HYPONATRAEMIA IN ICU SETTING

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ABSTRACT

BACKGROUND

Hyponatremia is the most common electrolyte imbalance encountered in hospitalized patients worldwide. Our study is designed to analyse aetiology, clinical presentations, associated co-morbidities, severity, rate of correction and clinical outcome of hyponatremia in diverse group of patients in ICU.

The aim of the study was to evaluate the prevalence, aetiology, clinical features and effect of various factors on the outcome of hyponatremia in patients admitted in ICU.

MATERIALS AND METHODS

All indoor general medicine admissions in the department of medicine, Darbhanga Medical College, Laheriasarai, Bihar during Feb. 2017 to Feb. 2018 were screened for hyponatremia and patients requiring ICU care were studied.

RESULTS

In our study, 6% of total admission had hyponatremia. Hyponatraemic patients admitted in ICU showed varied clinical presentation such as nausea (70%), malaise (88%), drowsiness (38%), lethargy (62%), confusion (32%), altered sensorium (44%) and convulsion (4%). Average serum Na was 122 meq/L, average serum osmolality was 268 mosm/L, average Hb was 10.6 gm/dl. 33% patients had raised serum creatinine (>1.4 mg/dl). Lower GCS was associated with a significantly lower survival (p value = 0.004). There was no significant association between serum Na on admission and the duration of hospital stay (p value= 0.06). Overall mortality was 18/50 (36%) which was quite significant as compared to total ICU mortality (30%). Most of the mortality was due to sub-optimal correction of Na.

CONCLUSION

Hyponatremia is quite a common electrolyte disorder encountered in ICU setting. Most common cause is SIADH. Hyponatraemic patients who presented with altered sensorium had poor outcomes. Type of fluid used for correction had not so much influence over the outcome. Under correction of hyponatremia in first 24 hour had poorer outcome whereas overcorrection had no any survival benefit, rather it was associated with risk of CPM.

KEYWORDS

Hyponatremia, SIADH, Central pontine myelinosis (CPM), GCS.

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BACKGROUND

Hyponatremia (serum Na^+<135 meq/L) is the most common electrolyte abnormality encountered in hospitalized patients worldwide.[1] Prevalence of hyponatraemic patients is 3.5%-40.0%.[2-4] The commonest cause of euvolemic hyponatremia is SIADH, other causes being diuretics, CCF and liver disorder, etc.[5-6]

Hyponatremia is classified as hypovolemic, euvolemic and hypervolemic.[7] Pseudohyponatremia (hyperglycaemia, hyperlipidaemia, etc.) should be ruled out. Serum Na^+ and urine Na^+ are the basic investigation. Hypovolemic hyponatremia is associated with signs and symptoms of volume depletion. Hyponatremia with normal or increased volume status is classified as euvolemic hyponatremia, whereas hyponatremia with signs of increased ECF volume status is classified as hypervolemic hyponatraemia.[8-9]

Treatment of hyponatremia depends on its type. Hypovolemic hyponatremia is corrected with volume replacement with 0.9% Normal saline, whereas euvolemic and hypervolemic hyponatremia is treated with water restriction and 3% saline.

Acute hyponatremia (<48 hours) can present as encephalopathy and if not treated immediately can result into brain herniation and death.[10] Acute symptomatic hyponatremia can be treated by 3% NaCl given over 10 minutes, to increase serum sodium by 4-6 meq/L. Chronic hyponatremia is treated slowly at the rate of 5-10 ml/ hour. Rapid correction in cases of chronic hyponatremia can lead to neurological sequelae (Central pontine myelinosis). Patients with euvolemic hyponatremia due to SIADH, hypothyroidism, or secondary adrenal failure will respond to successful treatment of the underlying cause, with correction of serum sodium. All causes of SIADH are not

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immediately reversible, so pharmacological therapy is necessary to increase plasma sodium concentration. Hyponatremia due to beer potomania and low solute intake responds well to intravenous saline and resumption of a normal diet.

Symptoms	No. of Cases (N = 50)	% of Cases
Nausea	35	70
Malaise	44	88
Lethargy	31	62
Drowsiness	19	38
Confusion	16	32
Convulsion	2	4
Altered sensorium	22	44

Table 1. Different Symptoms of Hyponatremia

Duration of Correction	S. creatinine	
	<1.4	>1.4
<3 days (N= 35)	18 (51%)	17 (49%)
>3 days (N= 15)	10 (67%)	5 (33%)

Table 2. Association b/w S. Creat. & S. Na

MATERIALS AND METHODS

Aim

The aim of our study was to screen all patients presenting with hyponatremia in medical emergency or ward and study the clinical presentations, aetiology, the effect of associated co-morbidities and rate of correction on the outcome of hyponatremia.

All indoor general medicine patients admitted in medicine department of Darbhanga medical college, Laheriasarai, Bihar over a period of 12 months were screened for hyponatremia and patients requiring ICU care and satisfying inclusion criteria were studied. Patients developing hyponatremia later on (after 24 hour) and those having pseudo-hyponatremia (due to hyperglycaemia, hyperlipidaemia, mannitol therapy were excluded). Sample size was 50 patients.

Detailed history and clinical examination was done. Demographic profile, symptoms of hyponatremia, associated co-morbidities, similar history in the past were noted. Detailed clinical examination was done with special emphasis on volume status and CNS symptoms. Different symptoms of hyponatremia are nausea, vomiting, headache, confusion, gait abnormality, muscle weakness, cramps, seizures, delirium, and altered sensorium.

Serum electrolytes and urine Na were tested for all patients in ICU. Besides that, routine biochemistry such as CBC, RFT, LFT, ABG were carried out to all patients. Special tests such as serum osmolality, urine osmolality, TSH, basal cortisol, CSF examination, CT /MRI of brain were also done wherever needed. Patients were classified into euvolemic, hypovolemic and hypervolemic types of hyponatremia depending on clinical findings.

Outcome was measured in terms of mortality, duration of hospital stay, days of correction of Na, any complication (such as osmotic demyelination syndrome, volume overload, requirement of ventilator), etc. Follow up was done till discharge or death of the patient.

Continuous variables were summarized in terms of no. of observation, Mean and SD, whereas categorical data were summarized by using frequencies and percentages. Association between outcomes were estimated by Student's t test and Chi square test.

RESULTS

Out of 12, 400 admissions, 744 patients (6%) were having hyponatremia (serum Na <135) on day 1. Out of these 744 patients, 50 patients were admitted in ICU. 2 patients were excluded in view of pseudo-hyponatremia (hyperlipidaemia). 39 patients were male and median age was 50 years. Proportion of different symptoms of hyponatremia is shown in **table 1.**

Almost equal distribution of all the three types of hyponatremia was noted. SIADH was present in almost all patients of euvolemic hyponatremia. Commonest cause of SIADH was lung pathology, followed by CNS infections, GB syndrome, etc. Among hypervolemic hyponatremia, majority were having AKI, CKD, CHF, CLD, etc. Of the hypovolemic hyponatraemic patients, causes were dehydration, cerebral salt wasting, AKI, salt losing nephropathy, diuretic, etc.

Average serum Na was 122 meq/L, average serum osmolality was 268 mOsm/L, average Hb was 10.6 gm/dl. 33% patients had raised serum creatinine (>1.4 mg/dl).

Age or gender of the patients had not so much influence on survival, hospital stay or days of correction of hyponatremia. Patients with high SBP on admission had longer hospital stay as compared to those with low or normal SBP. Lower GCS was associated with a significantly lower survival (p value = 0.004). There was no significant association between serum Na on admission and the duration of hospital stay (p value= 0.06). No significant association was noted between serum creatinine on admission and survival (p value = 0.08), however patients with lower creatinine had a significantly shorter duration of correction of hyponatremia (p value = 0.016) **(table 2).** Out of 50 patients, only 10 patients required 3% NaCl for correction and rest were treated with normal saline.

Total mortality was 18/50 (36%) which was quite significant as compared to total ICU mortality (30 %). Most of the mortality was due to sub-optimal correction of Na.

DISCUSSION

In our study, 6 % of total admission had hyponatremia. Our findings are consistent with a study done by Chatterjee-et-al in Kolkata. Male- female ratio was 3.54. Age ranged from 18-85 yrs. with median age being 50. Many studies in the past had shown the strong association of advancing age and hyponatraemia,[11-13] however gender is not an important risk factor. Different symptoms attributed to hyponatremia included nausea (70%), malaise (88%), lethargy (62%), drowsiness (38%), confusion (32%), convulsion (4%), and altered sensorium (44%). The different co-morbidities that were assessed included hypertension, diabetes, chronic kidney damage, acute kidney injury, ischemic heart disease,

tuberculosis, etc. Almost similar distribution of all the three types of hyponatremia was noted. Causes of hypovolemic hyponatremia were dehydration, diuretics especially thiazides, salt losing nephropathy, etc. Causes of euvolemic hyponatremia were SIADH, CNS infections, psychogenic polydipsia whereas that of hypervolemic hyponatremia were congestive heart failure, AKI, CKD and CLD. Several studies have depicted that thiazides attributed to severe hyponatremia, especially in elderlies.

Outcome was measured in terms of survival, duration of correction and duration of hospital stay. Overall mortality among hyponatraemic patients admitted in ICU was 18/50 (36%) which was quite significant as compared to total ICU mortality (30%). Males have slightly shorter duration of hospital stay. Our study also showed that associated co-morbidities like HTN, DM, CKD did not have any effect on overall survival of hyponatraemic patients. Patients having low systolic BP on admission had shorter duration of correction as compared to patients with normal or high SBP on admission. A significant association was found between serum Na on admission and survival, with patients with lower Na level on admission having lower survival rate (p value = 0.05). Also, lower Na level on admission also took longer duration of correction. This finding is consistent with a meta-analysis which showed inversely proportional relation between serum Na on admission and risk of mortality. Admission serum creatinine level did not predict the survival or hospital stay of hyponatraemic patients in ICU, however a lower serum creatinine was significantly associated with a shorter duration of correction as compared to patients with higher serum creatinine on admission. This finding is associated with a study which showed that hyponatremia in CKD patients has adverse outcome.[14]

Type of fluid used for correction of hyponatremia did not affect the duration of correction and also did not affect survival or ICU stay in our study. However appropriate fluid should be given depending on the type and severity of hyponatremia. A study showed that acute symptomatic hyponatremia should be aggressively treated with 3% NaCl. Another study depicted that too rapid correction of hyponatremia with 3% saline resulted in central pontine myelinosis. Also, slower rate of correction has been associated with higher mortality risk. So, it is prudent to monitor serum Na level precisely so as to avoid complication associated with rate of correction.[15-16]

CONCLUSION

Hyponatremia is quite common electrolyte disorder in hospital set up (6%). There is almost equal distribution of euvolemic, hypervolemic and hypovolemic hyponatremia. Most common cause of euvolemic hyponatremia is SIADH. Common clinical presentation of hyponatremia is malaise, nausea and drowsiness. Mortality rate is quite high as compared to other causes. Longer duration of stay is seen in the presence of co-morbidities. A lower GCS and lower serum Na on admission is associated with prolonged ICU stay and lower survival. Type of fluid used for correction did not influence the outcome. Optimum correction is required as both under correction or inadequate correction and over correction has poorer outcome.

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