Section: Medicine

Evaluation of Electrolyte Disturbances among Hypotensive Patients.

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ABSTRACT

Background: Subjects with hypotension usually show acid–base and electrolyte disorders, due both to the activation of several neurohumoral mechanisms and to drugs used in this condition. These abnormalities reflect the severity of hypotension and contribute to the functional impairment and to the poor long-term prognosis. The common electrolyte abnormalities are hyponatremia, hypokalemia, and hypomagnesemia. Aim of the study:To evaluate electrolyte disturbance among hypotensive patients. **Materials & methods:** The study was conducted in the department of general medicine of the PDDU Government Hospital, Sagwara, Dungarpur, Rajasthan, India.. For the study we selected patients reporting to the outpatient department for the follow up visit of hypotension. After applying inclusion and exclusion criteria, a total of 45 patients were included in the study population. An informed written consent was obtained from the patients after explaining them the procedure of the study verbally. For the evaluation of electrolyte disturbance venous blood was obtained by venipuncture from each patient. **Results:** A total of 45 patients were included in the study. The number of female subjects was 24 and number of male subjects was 21. Mean age of the pateitns in the study was 42.33 years. Mean blood pressure reading at baseline was 110/72 mmHg. The mean blood level of sodium was 144.21 + 9.21 mEq/L, the mean blood level of potassium was 4.2+0.51 mEq/L, the mean blood level of chloride was 102.21 + 8.21 mmol/L and the mean blood level of bicarbonate was 32.31+10.02 mmol/L. **Conclusion:** Within the limitations of the study we conclude that electrolyte level in our study group was within normal ranges except for bicarbonate. Further studies are required in this context for more clarity.

Keywords: Hypotension, electrolytes, sodium, potassium.

INTRODUCTION

Hypotension is defined as a sustained reduction of systolic blood pressure (SBP) of at least 20 mm Hg or diastolic blood pressure (DBP) of 10 mm Hg. The diagnosis can be made easily at the bedside by measuring blood pressure (BP) and heart rate.[1,2] The most sensitive and consistent measurements are the ones obtained early in the morning, when patients are usually more symptomatic. In patients with hypertension, a reduction of SBP of 30 mm Hg is more appropriate to define hypotension because the magnitude of the fall in BP depends on the baseline BP. However, prospective studies demonstrate that a decline in SBP of >20 mm Hg is a risk factor for falls, especially in elderly patients with hypotension.[3,4] Subjects with hypotension usually show acid–base and electrolyte disorders, due both to the activation of several neurohumoral mechanisms and to drugs used in this condition.

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These abnormalities reflect the severity of hypotension and contribute to the functional impairment and to the poor long-term prognosis.[5] The common electrolyte abnormalities are hyponatremia, hypokalemia, and hypomagnesemia. The acid–base disturbances generally observed are metabolic alkalosis pure or combined with respiratory alkalosis. Several mechanisms interact to produce these alterations.[6] Hence, we planned the study to evaluate electrolyte disturbance among hypotensive patients.

MATERIALS AND METHODS

The study was conducted in the department of general medicine of PDDU Government Hospital, Sagwara, Dungarpur, Rajasthan. The ethical clearance for the study was obtained from the ethical board of the institute prior to commencement of the study. For the study we selected patients reporting to the outpatient department for the follow up visit of hypotension.

<u>Inclusion criteria for the study are given below</u>

- Age ranging between 18 to 60 years
- Diagnosed with hypotension for more than 2 years
- On regular medication for hypotension
- No record of hospitalization for 2 years

Exclusion criteria for the study are given below:
- History of other chronic systemic disease such as diabetes mellitus
- History of cardiac disease or cardiac surgery
- On corticosteroids for more than 6 months in previous 2 years
- Not willing to participate in the study

After applying inclusion and exclusion criteria, a total of 45 patients were included in the study population. An informed written consent was obtained from the patients after explaining them the procedure of the study verbally.

For the evaluation of electrolyte disturbance venous blood was obtained by venipuncture from each patient. The blood sample was stored in a specimen container with EDTA and was labeled carefully for each patient to avoid any bias. The samples were sent to department of pathology for evaluation of electrolyte balance in the blood samples. The results obtained were tabulated and subjected to statistical analysis.

The statistical analysis of the data was done using SPSS version 20.0 for windows. The Student's t-test and Chi-square test were used to check the significance of the data. The p-value less than 0.05 was predetermined as statistically significant.

RESULTS

[Table 1] shows the demographic data of the subjects. A total of 45 patients were included in the study. The number of female subjects was 24 and number of male subjects was 21. Mean age of the pateitns in the study was 42.33 years. Mean blood pressure reading at baseline was 110/72 mmHg. [Table 2] shows the mean electrolytes level in hypotensive patients. The mean blood level of sodium was 144.21 + 9.21 mEq/L, the mean blood level of potassium was 4.2+0.51 mEq/L, the mean blood level of chloride was 102.21 + 8.21 mmol/L and the mean blood level of bicarbonate was 32.31+10.02 mmol/L. on comparing the results, we found that the results are statistically non-significant (p>0.05) [Figure 1].

Table 1: Demographic data

Variables	Values
Total no. of patients	45
No. of male/ female subjects	21/24
Mean age of the patients (years)	42.33
Mean blood pressure reading at baseline (mmHg)	110/72

Table 2: Mean electrolytes level in hypotensive patients

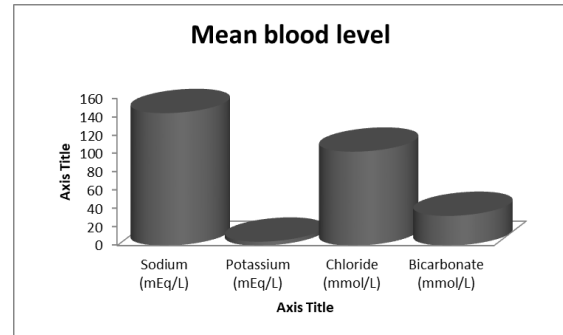| Electrolyte	Mean blood level	p-value
Sodium (mEq/L)	144.21+ 9.21	0.221
Potassium (mEq/L)	4.2+ 0.51	
Chloride (mmol/L)	102.21 + 8.21	
Bicarbonate (mmol/L)	32.31+10.02	

Figure 1: Mean electrolytes level in hypotensive patients

DISCUSSION

In the present study we evaluated electrolyte disturbance among hypotensive patients. We observed that hypotensive patients in our study had normal mean blood level of sodium, potassium and chloride but mildly elevated bicarbonates level. But the results were statistically non-significant. The results were compared with previous studies and results were consistent with previous studies. Liamis G et al determined the incidence of various electrolyte abnormalities encountered in hyponatremic patients admitted to an internal medicine clinic, as well as to investigate the possible pathogenetic mechanisms responsible for these abnormalities. They prospectively studied 204 adult patients who either on admission to our clinic or during their hospitalization were found to have hyponatremia. Ninety-two patients (45.5%) had at least one additional electrolyte abnormality. Hypophosphatemia was the most frequent electrolyte disorder observed (35 patients, 17%). Hypokalemia was seen in 32 patients (15.8%), hypomagnesemia in 31 patients (15.2%) and hyperkalemia in 12 patients (5.9%). Moreover, 5 patients (2.5%) had hyperphosphatemia, 4 patients (1.9%) exhibited hypermagnesemia, 3 patients (1.4%) had hypercalcemia, and 6 patients (2.9%) had true hypocalcemia. There were no statistically significant differences regarding the incidence of these electrolyte abnormalities (as a whole) between the main subgroups of hyponatremic patients (diuretic-induced, syndrome of inappropriate antidiuretic hormone, hypovolemia-induced and edematous state-related). However, hypokalemia and hypomagnesemia were more frequently observed in patients with diuretic-induced hyponatremia, while hyperkalemia was more frequently seen in edematous state-related hyponatremia. They concluded that additional electrolyte abnormalities are frequently encountered in patients with hyponatremia of any origin admitted to an internal medicine clinic. Liamis G et al conducted another study to determine the prevalence and risk factors of common electrolyte disorders in older subjects recruited from the general population. A total of

5179 subjects aged 55 years or more were included from the population-based Rotterdam Study. We focused on hyponatremia, hypernatremia, hypokalemia, hyperkalemia, and hypomagnesemia. Multivariable logistic regression was used to study potential associations with renal function, comorbidity, and medication. The adjusted mortality also was determined for each electrolyte disorder. A total of 776 subjects (15.0%) had at least 1 electrolyte disorder, with hyponatremia (7.7%) and hypernatremia (3.4%) being most common. Diabetes mellitus was identified as an independent risk factor for hyponatremia and hypomagnesemia, whereas hypertension was associated with hypokalemia. Diuretics were independently associated with several electrolyte disorders: thiazide diuretics (hyponatremia, hypokalemia, hypomagnesemia), loop diuretics (hypernatremia, hypokalemia), and potassium-sparing diuretics (hyponatremia). The use of benzodiazepines also was associated with hyponatremia. Hyponatremic subjects who used both thiazides and benzodiazepines had a 3 mmol/L lower serum sodium concentration than subjects using 1 or none of these drugs. Hyponatremia and hypomagnesemia were independently associated with an increased mortality risk. They concluded that electrolyte disorders are common among older community subjects and mainly associated with diabetes mellitus and diureticts. Subjects who used both thiazides and benzodiazepines had a more severe degree of hyponatremia.[7,8]

Arampatzis S et al investigated the associations between diuretics being taken and the prevalence of electrolyte disorders on admission as well as the impact of electrolyte disorders on patient outcome. All patients presenting between 1 January 2010 and 31 December 2011 to the emergency room (ER) of the Inselspital, University Hospital Bern, Switzerland were included. Data on diuretic medication, baseline characteristics and laboratory data including electrolytes and renal function parameters were obtained from all patients. A multivariable logistic regression model was performed to assess the impact of factors on electrolyte disorders and patient outcome. A total of 8.5% of patients presenting to the ER used one diuretic, 2.5% two, and 0.4% three or four. In all, 4% had hyponatremia on admission and 12% hypernatremia. Hypokalemia was present in 11% and hyperkalemia in 4%. All forms of dysnatremia and dyskalemia were more common in patients taking diuretics. Loop diuretics were an independent risk factor for hypernatremia and hypokalemia, while thiazide diuretics were associated with the presence of hyponatremia and hypokalemia. In the Cox regression model, all forms of dysnatremia and dyskalemia were independent risk factors for in hospital mortality. They concluded that existing diuretic treatment on admission to the ER was associated with an increased prevalence of electrolyte disorders. Lindner G et al investigated whether a relationship exists between age and gender and serum sodium and potassium as well as the prevalence rates in a large population of patients presenting to the emergency department of a university hospital. In this retrospective analysis they gathered data on age, gender and current diuretic medication of all patients admitted to the emergency department of a large university hospital with measurement of serum sodium and potassium between January 1, 2009 and December 31, 2010. Prevalence rates of and risk factors for electrolyte disorders were calculated on the basis of these data. A total of 20,667 patients were included in the analysis. Serum sodium levels declined significantly with increasing age while serum potassium rose, independent of diuretic medication at presentation. The prevalence rates of hyponatremia and hyperkalemia increased from 2.3% for hyponatremia in patients aged 16-21 years to 16.9% in patients aged >80 years and from 0.8% for hyperkalemia to 10.4%. In the regression analysis, age >60 years was a predictor for the presence of hyponatremia and hyperkalemia as was current use of diuretic medication. Male gender was associated with a decreased prevalence of hyponatremia and hypokalemia, while it was a predictor of hyperkalemia. They concluded that sodium levels were lower with increasing age, independent of diuretic intake, while potassium levels were higher.[9,10]

CONCLUSION

Within the limitations of the study we conclude that electrolyte level in our study group was within normal ranges except for bicarbonate. Further studies are required in this context for more clarity.

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