

Prevalence of Patient Load with Electrolyte Abnormalities Presenting to Emergency Department at a Tertiary Care Hospital

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ABSTRACT

Disturbances in electrolytes are frequently observed in the emergency departments. There were 12500 patients admission (episodes) with various electrolyte abnormalities studied to check the prevalence of electrolyte imbalance in the patients admitted in the emergency department of a tertiary care hospital. Hyper and hypo abnormalities in Potassium, sodium and calcium were the common abnormalities and were present in 40.7%, 36.16% and 6.7% respectively. Patients with malignancy pre dominantly had electrolyte imbalances particularly hyponatremia, hypokalemia and hypercalcemia. Because of the high incidence rate of chronic co morbid conditions with electrolyte imbalance have multiple admission to ED, The ED physicians must be acknowledged and understand the dynamics of fluid and electrolyte balance and their early correction in patients admitted for short term care in the emergency department. The routine measurement of these electrolytes in all patients admitted in emergency department may be warranted for early detection and correction of any derangement in various electrolytes.

Key words: Episodes, Electrolyte imbalance, hyponatremia, hyponatremia, hyperkalemia, hypokalemia, hypercalcaemia, hypercalcemia

INTRODUCTION

Disturbances in electrolytes are frequently observed in the emergency department (ED) and have important clinical implications. Electrolytes are

involved in maintaining homeostasis in the body, various studies have reported that fluid and electrolyte imbalance is associated with the increased morbidity and mortality in a broad spectrum of patients from asymptomatic to critically ill. (1,2) The composition of fluids varies from one body compartment to another. In extracellular fluid (ECF) the principal electrolytes are sodium, chloride and bicarbonate, other electrolytes like potassium, calcium and magnesium are also present but in much smaller quantities; While intracellular compartment (ICF) contains more of potassium and magnesium ions with sulphate and phosphate being the major anions. Electrolyte imbalances are commonly observed in many medical and surgical conditions. These electrolyte and fluid abnormalities are usually linked to each other therefore every electrolyte abnormality must be considered in relation to each other for a successful and effective correction in any patient. Most of the important and prevailing electrolyte imbalances are hypo- and hyper-states of sodium, potassium, calcium, and magnesium. The kidney is the main responsible organ for retention and excretion of electrolytes and fluid in healthy individuals. (3) Studies about the clinical prevalence of electrolyte imbalances often report that these disorders are frequently seen in elderly and critically ill patients, and occur in the progression of diseases such as

malignancies, diabetes mellitus, acute or chronic renal failures, severe cardiovascular events like myocardial infarctions, etc. (4-6) unusual body fluid loss in different diseases and drugs also produces electrolyte abnormalities. Hence, Correction of electrolyte imbalance is very important and necessary to maintain the homeostasis in the body.

MATERIAL AND METHOD

It was a cross-sectional study conducted on patients attending the emergency department of SKIMS Soura Srinagar over a period of three years from October 2016 – September 2019. A total of 12500 patient episodes over 18 years of age were included in the study. Majority of the patients had multiple admissions particularly the patients with underlying malignancy and many had more than one electrolyte imbalance. The patients presented to emergency department for different medical complaints. Patients with trauma and other surgical conditions were not included in the study. After admission and clinical examination of patients in the emergency department data was collected from the patient's record file on daily basis. Complete information of demographic parameters, drug use and Co morbidities present were recorded. Diagnosis and laboratory investigations of the patients were recorded in a tabulated data and maintained in excel sheets. Test of

electrolytes were performed by VBG analyzer. SPSS 11.5 version software was used for statistical analyses in this study. Descriptive statistics were presented as frequencies and percentages.

RESULTS

There were 12500 patients (episodes) with electrolyte imbalance, 54% (n=6850) were male and 46% (n=5650) were females. The mean age of patients was 44.8 ±18.8 years. Hypokalemia and hyponatremia were observed the two predominant abnormalities. The distribution of electrolyte imbalances among patients is given in Table: 1. All the patients had at least one co morbid disease and were on treatment for one or the other illness and majority of the patients had multiple admissions (episodes). The most frequent co morbidity found was malignancy of different organs and were observed in 4484(35.87%) of the admission episodes, followed by kidney disease, cardiovascular, hepato biliary diseases and endocrine disorders in 2640 (21.1%), 1512(12%), 1220(9.8%) and 585(4.7%) respectively. Most frequent oncological diagnoses in these patients were lung followed by breast. By physical, clinical and laboratory examinations, sepsis was frequently suspected in majority of patients. Prevalence of co morbid conditions and electrolyte imbalance in them is shown in table: 2

Table 1: Distribution of electrolyte imbalance among 12500 patient episodes

Electrolyte	Abnormality	Normal	Number (%)
Sodium (mmol/l)	Normal	135-145 mmol/L	7980 (63.84%)
	Low		3415 (27.32%)
	High		1105 (8.84%)
Potassium (mmol/l)	Normal	3.5-5mmol/L	7415 (59.3%)
	Low		3987 (31.9%)
	High		1098 (8.78%)
Calcium (mg/dl)	Normal	8.5-10.5 mg%	11664 (93.3%)
	Low		180 (1.44%)
	High		656 (5.25%)

Table: 2 Electrolyte imbalances and the underlying chronic disease ailments.

Parameter	Malignancy	Cardiovascular vascular N (%)	Endocrine N (%)	Renal diseases N (%)	GIT & Hepatobiliary N (%)	Total no
Hypernatremia(mmol/l)	347 (31.4%)	143 (12.9%)	154(13.9%)	353(31.9%)	108 (9.8%)	1105
Hyponatremia(mmol/l)	1261(36.9%)	1218(35.7%)	125(3.7%)	245(7.1%)	566(16.5%)	3415
Hyperkalemia(mmol/l)	79(7.1%)	207(18.8%)	72(6.7%)	417(38%)	323(29.4%)	1098
Hypokalemia(mmol/l)	2271(57%)	1017(25.5%)	146(3.7%)	335(8.4%)	218(5.5%)	3987
Hypercalcemia(mg/dl)	448(68.29%)	45(6.86%)	82(12.5%)	78(11.9%)	03(0.46%)	656
Hypocalcemia(mg/dl)	78(43.3%)	10(5.5%)	06(3.3%)	84(46.6%)	02(1.1%)	180

DISCUSSION

Changes in electrolyte levels observed in ED have important clinical implications and there may be coexistent fluid and acid base imbalance also. In this study we evaluated the prevalence of patient load with electrolyte imbalance in association to underlying comorbid conditions in patients admitted to our emergency department (ED). Literature data generally focused on imbalances of specific electrolytes, and the majority of the studies recruited patients of a specific disease or risk group. To our knowledge, only four studies focused on electrolyte imbalances in emergency department patients, and two of them conducted with elderly patients. (7-9) The physiological and biochemical activities going on in the body are closely dependent on body electrolytes. Being essential and crucial to the functioning of every cell in the body, the electrolytes are tightly regulated in the body. This involves consumption of considerable energy in order for the homeostasis to be maintained. For the sustenance of the normal physiological functioning of the muscles and nerves the electrolyte gradients are precisely controlled between the intracellular and extracellular compartments of the body. Electrolytes regulate acid-base; fluid and osmotic pressure of the body fluids thereby preserve the normal neuromuscular irritability of cell. Disorders of the systems responsible for maintaining the stability of the electrolytes (like kidneys, hormonal activities of antidiuretic hormone, aldosterone and parathyroid hormone) may deteriorate the balance in electrolytes and result in emergencies. The unusual loss of body fluid in different disease conditions and treatment also adds to fluid and electrolyte imbalances. Correction of sodium and potassium imbalance are important in patients who need intensive care as, they are associated with increased mortality in these patients regardless of age, gender and diagnoses. (10) Our study center provides tertiary health care services for patients with advanced diseases, malignancy, complicated

and sick patients. Therefore, it was very much needed to check the spectrum of electrolyte abnormalities and load of such patients presenting for medical care to emergency department. Patients with electrolyte abnormalities present frequently in the emergency department with variable subjective complaints. We tried to highlight the importance of dyselectrolyemia in sick patients and a possible early and ideal correction. We did not analyze the cause of various electrolyte abnormalities in our group of patients. Potassium imbalance was observed to be the commonest abnormality and was found in 5085(40.68%) patients episodes, of which hypokalemia was detected in 3987(31.9%) and hyperkalemia in 1098(7.78%) patient episodes. This is consistent with the observation by others. (11) Hypokalemia was more prevalent in patients with underlying malignancy who were on chemotherapy radiotherapy. Persistent nausea, vomiting and inadequate intake secondary to chemotherapy led to hypokalemia. Patients with Cardiovascular diseases particularly hypertension and congestive heart failure on diuretics were responsible for both hypo and hyperkalemia. Hyperkalemia is a rare condition, but we found it in 7.8% of our patients. It is reported that potassium secretion from thrombocytes and leukocytes in severe thrombocytosis and leukocytosis may cause pseudo-hyperkalemia. (12) We determined that the first three of most frequent diagnoses were renal failure, and concluded that these clinical conditions, particularly renal failure, drugs and sepsis might have caused hyperkalemia in our patients. Drugs are understood to be common responsible factor for both hyper and hypokalemia. It is known that spiked T waves are specific to hyperkalemia, but we did not find tall T wave in all of our patients with hyperkalemia. We determined sodium imbalance in 4520(36.16%) of our patients, of which 3415(27.32%) had hyponatremia and 1105(8.84 %) had hypernatremia. This rate of sodium imbalance was defined in accordance with the literature data. (11, 13)

Patients with malignancy and cardiac disease on diuretics for heart failure and hypertension were a common responsible factor for hyponatremia. Abnormalities in calcium balance were present in 836(6.7%), of which hypercalcemia and hypocalcemia were detected in 656(5.25%) and 180(1.4%) of patient episodes, respectively. The incidence of hypercalcemia (5.25%) in our study was compatible with other studies, conducted in general population and hospitalized patients. (12,13) Majority of patient episodes with hypercalcemia were with malignancy and had multiple admissions. Others have observed incidence of hypercalcemia and hypocalcemia in 3% and 6% respectively. (14) Calcium has many functions in intracellular enzymatic pathways, and also plays a role in cellular damage and cell death. (15) Altered sensorium of variable severity was one of the most frequent finding in physical examinations. Of the 656(5.25%) patients episodes with hypercalcemia, It was observed that most of the patient episodes were related to oncological diseases in 68% followed by endocrine causes including Vit D use in 12.5%, renal disease patients 11.9% followed by cardiovascular and hepatobiliary diseases in 6.8% and 0.46% respectively. The high rates of oncological diagnoses with frequent episodes of hospital admission resulted in high frequencies of calcium imbalance disorders in our patients. Our patient episodes with electrolyte imbalance having oncological diseases had multiple admissions related to chemo morbidity; which exposes them to major risk for electrolyte imbalances. Therefore, we were aware of electrolyte imbalances in patients admitted to the ED, particularly in those with underlying oncological diseases. Hence, our frequencies may not truly reflect the actual prevalence of each electrolyte's imbalance in the general population presenting to hospitals, and we cannot assume that patients have single electrolyte imbalances.

CONCLUSION

We, conclude that clinical symptoms and findings are reflections of multiple interactions of electrolytes and regulatory systems in the human body. Because of the high patient load with different electrolyte abnormalities and their variable clinical presentation, the ED physicians must be acknowledged and understand the dynamics of fluid, electrolytes and their correction in patients admitted for short term care in the emergency department and routine measurement of these electrolytes in all patients admitted in emergency department may possibly be warranted for early detection of any derangement for a better patient outcome.

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How to cite this article: Bhat AW, Bhat BW. Prevalence of patient load with electrolyte abnormalities presenting to emergency department at a tertiary care hospital. *Gal Int J Health Sci Res.* 2020; 5(4): 110-114.
