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Research Article

Prevalence of Electrolyte Abnormalities in Emergency Patients

Authors
Pallavi Mahajan[1], Ashima Badyal[2]
[1]Demonstrator, Department of Biochemistry, Government Medical College, Jammu, J&K, India
[2]Lecturer, Department of Biochemistry, Government Medical College, Jammu, J&K, India
Corresponding Author
Dr Pallavi Mahajan
Demonstrator, Department of Biochemistry, Government Medical College, Jammu, J&K
Phone no. 9419114012, Email: *pallavi31mahajan@gmail.com*

Abstract
Fluid and electrolyte balance is the most important parameter that maintains the normal homeostasis in the body. It is also important for the normal functioning of the cells and maintenance of acid-base balance in the body. Electrolyte disturbances are commonly present in most of the clinical disorders, so its correction is needed in the management of these diseases. The present study was conducted on the patients admitted in the emergency department of Government Medical College, Jammu in which the serum electrolytes and serum urea and creatinine levels were estimated to observe the prevalence of electrolyte abnormalities in these patients. It was observed that the hyponatremia is the most common electrolyte imbalance present in our study. Thus in the management of the patients admitted in emergency, the estimation of renal function tests and electrolytes should be done. As fluid therapy is the most common line of management in these patients while treating them the electrolyte abnormalities should be taken into consideration and should be treated accordingly.
Keywords: *electrolytes, renal function tests, electrolyte abnormalities, hyponatremia.*

Introduction

The most important parameter that maintains the normal homeostasis in the body is fluid and electrolyte balance and it also plays vital role in the functioning of cells, in maintaining tissue perfusion and acid-base balance. Electrolyte disturbances are common in most of the diseases and in the management of various clinical disorders, the fluid and electrolyte balance must also be maintained.(1) While estimating the electrolytes, the imbalances in every electrolyte must be considered for effective treatment of the patient. The most common electrolyte imbalances are hypo- and hyper-states of sodium, potassium, chloride, calcium, and magnesium. The kidneys are the main organ which is responsible for maintaining the electrolyte balance in the healthy individuals.(2) Besides the kidneys, the other mechanisms which are involved in the regulation of fluid and electrolyte balance in the organism are hormones like antidiuretic hormone, aldosterone, and parathyroid hormone, and

various other factors such as physiological stress and age also play important roles in the regulation of electrolyte balance. The abnormalities in the electrolyte balance can also occur as a consequence of structural and functional changes associated with ageing without the presence of any obvious disease in the kidney. The presence of dysnatraemia should be considered in the relation to water balance. When proportionally more water than sodium is lost from the extracellular fluid compartment and serum sodium concentration is more than 145 mmol/l, it results in hypertonic dehydration that can be as a result of age-related thirst impairment. When serum sodium concentration is less than 135 mmol/l and the proportion of sodium lost is greater than water, it results in hypotonic dehydration. This can be due to the use of diuretics. When there is proportionate loss of water and sodium, it results in isotonic dehydration and the serum sodium concentration is normal.[3]

It has been reported in various studies that the electrolyte imbalances were often seen in elderly and critically ill patients, and occur in the development of diseases such as acute or chronic renal failures, diabetes mellitus and myocardial infarctions, etc.[4] Thus the electrolyte imbalances are scientifically quantifiable biochemical parameters in the blood that determines the clinical manifestations of interactions between various metabolic events such as hormones, vascular events, deficiencies of hydration, medications, sepsis and renal physiology. Electrolyte abnormalities are also common in patients admitted in intensive care units. These abnormalities occur in various conditions and often remain undetectable, thus resulting in morbidity and mortality, irrespective of the chief problem.[5] Dysnatraemia is the most common electrolyte abnormality in older adults.[6] The various clinical manifestations of dysnatraemia differ depending upon its severity, seizure and coma being established complications.[7] Hence the present study was conducted to find the prevalence of electrolyte abnormalities in patients admitted in emergency department of the Government Medical College, Jammu.

Material and Methods

The present study was conducted for a period of three months in the patients admitted in the emergency department of Government Medical College, Jammu in which the serum sodium, potassium, chloride, blood urea and serum creatinine levels were estimated of 4572 patients. The estimation of electrolytes- Sodium, Potassium and Chloride was done on ion-selective electrode (ISE) method[8], and blood urea and creatinine was estimated using urease [9] and Jaffe's method [10]. The normal accepted range for sodium is 135-145 mEq/L, for potassium is 3.5-5.5 mEq/L, for chloride is 96-106 mEq/L, for urea is 15-45 mg/dl, and for creatinine is 0.6- 1.2 mg/dl in males and 0.5-1.1 mg/dl in females.

Results

The present study was carried out in 4572 patients. Out of which 2974 (64.62%) were males and 1618 (35.38%) were females. The mean age of patients was 45.26 years. Out of the total 4572 patients, 2839 (62.1%) patients presented with the complaints related to surgical problems whereas 1733 (37.9%) patients presented with complaints related to medical problems. The various electrolyte abnormalities were observed in patients like hyponatremia was observed in 53.19% patients, hypernatremia in 10.69 % patients, whereas 36.11% patients presented with normal sodium levels. Hypokalemia was observed in 47.15% patients, hyperkalemia in 14.72% and 38.12% patients presented with normal potassium levels. High urea levels were observed in 32.08% patients whereas in 20.53% patients raised creatinine levels were observed.

Table 1: Percentage of electrolyte abnormalities in patients

Parameters		Mean value	No. of patients	Percentage of patients (%)
Sodium (mEq/l)	Low	125.47	2432	53.19
	Raised	148.23	489	10.69
	Normal	139.45	1651	36.11
Potassium (mEq/l)	Low	2.78	2156	47.15
	Raised	5.82	673	14.72
	Normal	4.36	1743	38.12
Chloride (mEq/l)	Low	92.43	1839	40.22
	Raised	108.39	947	20.71
	Normal	101.74	1786	39.06
BloodUrea (mg/dl)	Raised	78.46	1467	32.08
	Normal	29.32	3105	67.91
Serum Creatinine (mg/dl)	Raised	2.12	939	20.53
	Normal	0.77	3633	79.46

Discussion

In the present study, it was observed that the most common electrolyte disorder was hyponatremia followed by hypokalemia and low levels of chloride. The high blood urea levels were also seen in 32.08% patients and hypercreatinemia was observed in 20.53% patients. It has been observed that dysnatraemia, predominantly hypernatraemia, was also linked with higher mortality rate of up to 70% in severe cases.[7] In patients with hypernatraemia, seven fold rises in mortality was observed as compared with age-matched hospitalised patients. In a study conducted by Herrod et al, on 1383 surgical patients, it was shown that the patients with dysnatraemias had a considerably higher mortality than the patients with normal serum sodium levels.[11] In another study conducted on orthopaedic patients, it was observed that hyponatraemia was related with a 2.1-fold rise in mortality in mild cases and 4.6-fold rise in severe cases.[12] The major proportion of dysnatraemia in elderly persons can be due to the presence of concurrent disease such as hyperglycemia and the syndrome of inappropriate ADH secretion (SIADH).[13] The other causes of dysnatraemia such as use of diuretics or excessive use of intravenous fluids should also be considered. Increased intake of processed foods that have more salt content and excess iatrogenic salt intake also results in hypernatraemia as older individuals require longer time to excrete salt loads due to reduction in eGFR with age. Even in physiologically normal individuals, the kidneys are also incapable to handle the excess chloride load. In another study conducted by Upadhyay et al, in ICU patients 30% of the patients had reduced serum sodium levels.[5] Presence of hyponatremia in seriously ill patients is related with disturbances in the mechanism of kidney in urine dilution and can lead to dehydration of the cells and damage to central nervous system. Laczi F also found that mild to moderate hyponatremia in 15-30% and severe hyponatremia in 1% - 4% of patients admitted in hospital.[14] The levels of electrolytes are controlled between intra- and extracellular compartments for maintaining the normal physiology of the muscles and nerves. The main organ which is responsible for this regulation is the kidney, but other mechanisms involved in the process are hormones like antidiuretic hormone, aldosterone and parathyroid hormone. The disturbances of these systems may affect the electrolyte balances, thus resulting in emergency problems. To monitor the sodium levels in ICU patients are important because both hypo- and hypernatremia are associated with higher mortality rates in these patients irrespective of their age, gender and diagnoses. In a study

conducted by Balci et al, they observed sodium imbalance in 65% of patients and hypokalemia in 15% and hyperkalemia in 8% patients. It is important to find out the physical aspects of hemodynamic changes of electrolyte levels in bloodstream, though the clinical signs and symptoms cannot be accredited to the imbalance of a single electrolyte. Balci et al also observed in their study that the patients who had hyperkalemia, the most frequent diagnosis were sepsis, infections and renal failure.[(1)] In our study, we also observed the higher blood urea levels in 32.08% patients and raised creatinine levels in 20.53% patients. This can be attributed to lack of proper fluid treatment, use of medicines which are nephrotoxic and infections were the main factors related with acute kidney failure. Many studies have found that fluid and electrolyte imbalances are connected with greater morbidity and mortality in critically ill patients, so to provide best possible care; health care providers must have acquaintance with reverence to the principles and practice of the physiology and pathophysiology of fluids and electrolytes.

Conclusion

Hence, in our study we observed that the patients admitted in emergency frequently present with disturbed renal functions often in combination with derangements in the fluid and electrolyte balance. There are also some limitations of the study like the serum calcium and bicarbonate levels were not included and also the frequencies of individual electrolyte abnormalities may not actually reveal the real prevalence of imbalance of electrolytes in the general population. Hence, a larger study including all the major electrolytes should be conducted. Because of the high incidence rate of electrolyte abnormalities, the physicians must be well-versed with the dynamics of fluid-electrolyte balance. So the timely identification, a thorough knowledge and understanding of the general electrolyte disorders is necessary to ensure their appropriate treatment.

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