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Prevalence of electrolyte imbalance in hospitalized patients and relationship to outcome and duration of stay in orthopaedic department

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Abstract
Background: Electrolyte imbalance is a severe and life-threatening condition, but its investigation and evaluation is often inadequate and inappropriate. The aim of the study is to identify the prevalence of electrolyte imbalance (Na & K) in hospitalized patients and to evaluate the relationship to their outcome and duration of stay in orthopedic department in a tertiary care hospital.
Materials and methods: 150 patients of both genders and all age groups excluding pediatric and neonate patients were evaluated. Study was carried out in Udai Omni hospital, Hyderabad between mid-december 2018 to march 2019.
Results: 150 patients were evaluated during the study period and electrolyte imbalance was found in 38 patients that is prevalence of electrolyte imbalance was 25.33%. This study has shown equal gender distribution of electrolyte imbalance (19 cases each) and are most commonly seen in elderly patients of age >60years (52.63%). The most common comorbid conditions seen in these 38 patients are Diabetes mellitus (DM), Hypertension (HTN), Hypothyroidism, Chronic kidney disease (CKD) etc. Most of the cases are seen with combined DM and HTN. Among all the electrolyte imbalance cases, the most commonly seen type of electrolyte imbalance are Hyponatremia and Hypokalemia (11 cases each). Most of the cases of electrolyte imbalance are seen pre-operatively. This study showed almost equal gender distribution of Hyponatremia. Distribution of Hypokalemia cases is relatively high in males. Out of 38 cases, 10 (26%) cases have shown increased duration of stay due to electrolyte imbalance. Among 38 cases, most commonly observed cause of electrolyte imbalance is CKD followed by these of diuretics. In this study most common presenting symptoms are constipation, nausea, vomiting, headache, confusion, weakness, dizziness and some patients were asymptomatic.
Conclusion: In this prospective, observational study on orthopaedic patients, prevalence of different electrolyte imbalance are seen, in which Hyponatremia and Hypokalemia are more common in hospitalized patients. Electrolyte imbalance complicates the health conditions of the patients and leads to increased falls and fractures and duration of hospital stay.

Keywords: Prevalence, electrolyte imbalance, orthopaedic, duration of stay, causes, symptoms

Introduction

Electrolytes are minerals that carry an electric charge. These electrolytes are essential for various bodily functions or processes, like proper nerve and muscle function, maintaining acid-base balance and keeping body hydrated.

The concentration of cations and anions is different in ICF and ECF. The ICF has a high concentration of potassium, magnesium (cations) and phosphates (anions). Whereas the concentration of sodium and chloride ions are relatively low in ICF. ECF has high concentrations of sodium and the main anions present are chloride and bicarbonates. For electrolyte homeostasis, the electrolyte concentration in both the cell and the plasma should be within normal limits. This normal limit of serum electrolyte concentrations can be maintained by proper balancing on the four processes – electrolyte intake, absorption, distribution and excretion. Any disturbances in these four processes can lead to electrolyte imbalances [1]. Electrolyte imbalance is a severe and life threatening condition, but its investigation and evaluation is often inadequate and inappropriate. The important electrolyte imbalances that are seen most commonly in clinical practice are of Sodium and Potassium [2]. Sodium Normal range is 136-145 mmol/L. Conditions that occur due to imbalanced sodium levels are: Hyponatremia (low sodium levels) and Hypernatremia (high sodium levels). Hyponatremia when under-recognized, incorrectly investigated and sub optimally managed, can lead to poor patient outcomes. Frequently insufficient diagnostic testing or investigations can affect both management and outcome of the patients [3]. Failure to correct the condition of hyponatremia may lead to delay or prevention of both patient outcomes and hospital length of stay [4, 5]. Potassium Normal range is 3.5 – 5.0 mmol/L. Conditions occur due to imbalance in potassium levels are: Hypokalemia and Hyperkalemia [1]. Common causes of electrolyte imbalance may include vomiting, diarrhea, excessive sweating, renal diseases, poor diet, acid base imbalance in the body, congestive cardiac failure, cancer treatment, old age, stress, use of some drugs such as diuretics, antidepressants, anti-epileptics etc and post-operative surgery patients are more

prone to electrolyte imbalances due to the loss of blood and bodily fluids, intravenous fluid administration, blood transfusions and the underlying surgical diseases [2, 6-11, 17, 18]. Electrolyte imbalances may lead to more health related complications like cognitive impairment, falls and fractures, increased hospitalization and cost of treatment which may in turn lead to decreased patient outcome [12, 14, 19, 20, 21, 22].

Materials and methods

150 hospitalized patients of both genders, of all age groups excluding pediatrics and neonates were evaluated for a prospective observational study on prevalence of electrolyte imbalance and relationship to outcome and duration of stay in orthopaedic department. The study was carried out in Udai Omni hospital located in Nampally, Hyderabad between mid-December 2018 to march 2019.

After taking the permission from the institutional authorities, Udai Omni Hospital, the case sheets were reviewed to collect the relevant data. The investigators also accompanied the staff during the ward rounds to gather the information.

All the relevant data was collected in a data collection form including demographic details of the subjects, past medical conditions, diagnosis, treatment chart, laboratory data and other relevant information. The patient's clinical presentation was also assessed in order to find the clinical presentation due to electrolyte imbalance. The possible cause for the electrolyte imbalance was also assessed.

Results

A 150 cases were assessed in orthopaedic inpatient ward during our study period. Out of total, 38 cases were found to have electrolyte imbalance. This study has shown an equal gender distribution of electrolyte imbalance 19 cases each.

Prevalence of electrolyte imbalance

The prevalence of electrolyte imbalance in hospitalized orthopaedic patients is 25.33%.

Table 1

Cases	No. of Cases	Percentage
Imbalance	38	25.33%
Normal	112	74.66%
TOTAL	150	100%

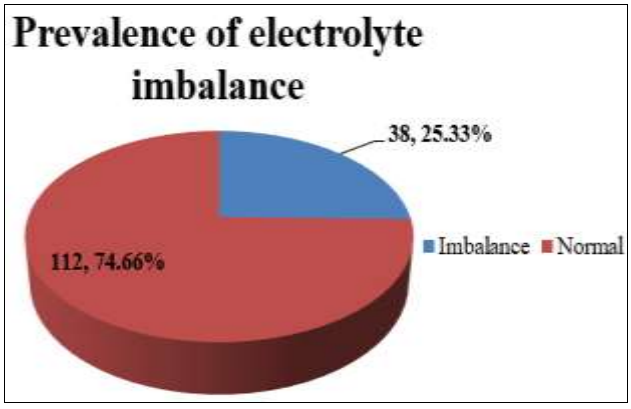

Fig 1

Distribution of patients based on age

The patients are distributed based on different ranges of age (in years). Among 38 patients, the patients of age group 60-79 years were found to have more electrolyte imbalance (52.63%).

Table 2

Age	Frequency	Percentage
20-39	10	26.31%
40-59	5	13.15%
60-79	20	52.63%
80-99	3	7.89%
Total	38	100%

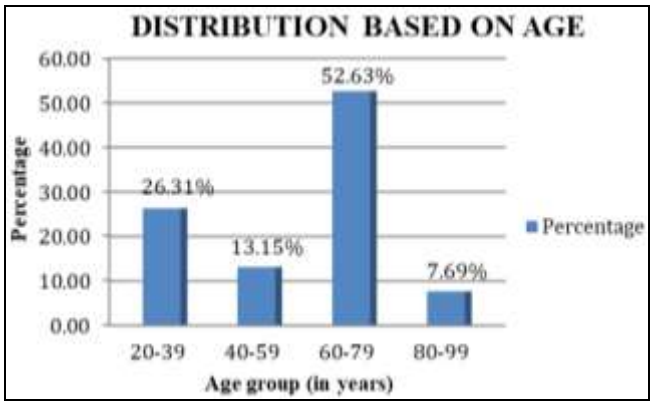

Fig 2

Distribution of patients based on type of electrolyte imbalance

Among all the electrolyte imbalance cases (100%), the most commonly seen type of electrolyte imbalance are Hyponatremia and Hypokalemia 11 cases (28.94%) each, where 7 cases (18.42%) are presented with both the type of electrolyte imbalance. There are no cases of hypernatremia. 5 cases of hyperkalemia and 4 cases of combined hyponatremia and hyperkalemia were seen.

Table 3

Type	Frequency	Percentage (%)
Hypernatremia	0	0
Hyponatremia	11	28.94
Hyperkalemia	5	13.15
Hypokalemia	11	28.94
Hypernatremia and hyperkalemia	0	0
Hypernatremia and hypokalemia	0	0
Hyponatremia and hyperkalemia	4	10.52
Hyponatremia and hypokalemia	7	18.42
Total	38	100

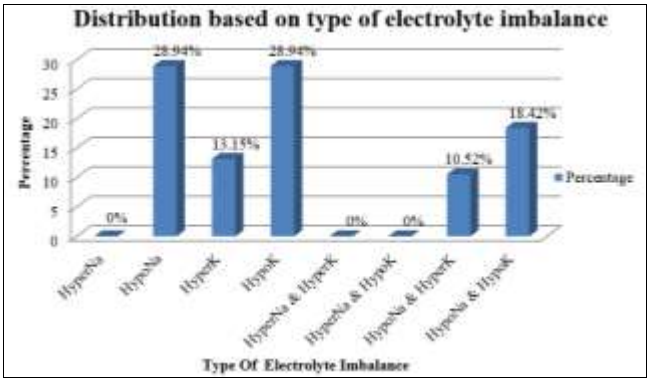

Fig 3

Distribution of patients based on duration of stay

Table 4

Subjects	Frequency	Percentage
With increased duration of stay	10	26%
Normal duration of stay	28	74%
Total	38	100%

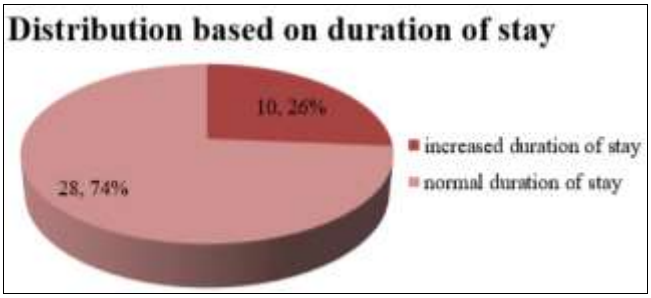

Fig 4

Out of 38 cases, 10 (26%) cases have shown increased duration of stay due to electrolyte imbalance and majority of cases are female patients (60%, 6 cases). Among these 10 cases, 4 cases (40%) are of Hyponatremia, and 2 cases (20%) are of Hypokalemia, 2 (20%) are cases with combined Hyponatremia Hypokalemia and 2 (20%) are cases with combined Hyponatremia & Hyperkalemia.

We have observed that out of 38 cases, 18 are of fracture cases among which 14 are due to falls. Most of these cases of falls are presented with hyponatremia.

In most of the cases, electrolyte imbalance are seen pre-operatively. The most common co-morbid conditions present along with electrolyte imbalance in these 38 cases are Diabetes mellitus (DM), Hypertension, hypothyroidism, chronic kidney disease (CKD), etc. Most of the cases are seen with combined DM and HTN.

In this study, we have also assessed common possible causes of electrolyte imbalance and also the presenting symptoms. Among 38 cases, mostly observed cause of electrolyte imbalance is CKD followed by use of diuretics. Other possible causes seen are hypothyroidism, CVA, trauma and some are of unknown cause. In this study most common presenting symptoms are constipation, nausea, vomiting, headache, confusion, weakness, dizziness and some patients were asymptomatic.

Discussion

The present study was aimed to identify the prevalence of electrolyte imbalance in hospitalized patients and relationship to outcome and duration of stay in orthopaedic department.

The principal results indicate that the electrolyte imbalance is common in hospitalized patients. The analysis study was conducted for 150 cases. In this study equal gender distribution of electrolyte imbalance is observed. The total population is divided into different age groups like 20-39 years, 40-59 years, 60-79 years and 80-99 years. Majority of electrolyte imbalance are seen in patients of age group between 60-79 years (56.63%, 20 cases), followed by patients of age group between 20-39 years (26.31%, 10 cases), 5 patients (13.15%) are of age group 40-50 years and 3 patients (7.89%) are of age group 80-99 years. The prevalence of electrolyte imbalance in patients >80 years is relatively low due to admission of less number of patients of that age group.

The most commonly seen co morbid conditions along with electrolyte imbalance are HTN, DM, Hypothyroidism and CKD respectively. All the cases that are presented with electrolyte imbalance are further distributed based on type of electrolyte imbalance. Out of 38 cases (100%) most commonly seen type of electrolyte imbalance are hyponatremia (28.94%) and hypokalemia (28.94%) with equal distribution, as we are considering only clinically significant hyponatremia cases. The prevalence of hyponatremia is 28.94% (11), as we are considering only clinically significant hyponatremia. In this study gender distribution in hyponatremia patients is slightly high in males (54.54%) than in females (45.45%). The number of patients presented with Hypernatremia are 'zero' (0%). The number of patients presented with hypokalemia is 11 (28.94%) and hyperkalemia is 5 (13.15%). 7 patients (18.42%) are presented with combined hyponatremia and hypokalemia and 4 patients (10.52%) are presented with both hyponatremia and hyperkalemia.

In this study most of the electrolyte imbalances are presented pre-operatively. In our study out of 38 cases (100%), duration of stay in hospital is increased for 10 patients due to electrolyte imbalance as it leads to delay of surgery (in some cases). Majority are hyponatremia cases. Our study is in line with the study conducted by Zaino CJ [12], *et al.*... Which shows similar results of increased duration of stay in hospital due to hyponatremia.

Out of 38 cases, 18 are of fracture cases among which 14 are due to falls. Most of these cases of falls are presented with hyponatremia, as reflected with the studies conducted by Kousch *et al.* [13].., Ayus JC *et al.* [15]... and Rittenhouse KJ *et al* [16].... which concluded that more elderly patients with hyponatremia are presented to the emergency department due to falls.

We also assessed for possible causes of electrolyte imbalance. The results showed that the majority of cases are of CKD and use of Diuretics. Our study is in concordance with the study conducted by Turgutalp. K *et al.* [14]... concluded that clinicians should be careful when prescribing diuretics in elderly patients.

Majority of the cases assessed shows the symptoms of constipation seen in 4 patients with hypokalemia and 1 patient with combined hyponatremia and hypokalemia. Nausea and vomiting is seen in 2 patients with hyponatremia, 2 patients with hyperkalemia and 1 patient with both hyponatremia and hyperkalemia. 3 patients are presented with headache out of which 2 are patients with hyponatremia and 1 patient is with combined hyponatremia and hypokalemia. Weakness and dizziness is seen in 2 patients with hyponatremia, 2 patients with hypokalemia and 1 patient each with both hyponatremia & hypokalemia and hyponatremia and hyperkalemia, confusion is seen in 2 patients with hyponatremia and few patients are asymptomatic.

Conclusion

Prevalence of electrolyte imbalance in hospitalized patients and relationship to outcome and duration of stay was assessed in an orthopaedic hospital.

From this study, it was concluded that electrolyte imbalances are common in hospitalized patients with equal gender distribution and majority of the cases are of elderly (>60years). Of all the types, Hyponatremia and

Hypokalemia are most commonly seen. These cases are also presented with most common co-morbid conditions like DM, HTN and CKD and other less common co-morbid conditions are Hypothyroidism, trauma, etc. We have observed that out of all cases, majority are fracture cases among which most are due to falls. Most of these cases of falls are presented with hyponatremia. Out of all the electrolyte imbalance cases duration of stay at hospital is increased for 10 cases. In this study, we have also assessed common possible causes of electrolyte imbalance and also the presenting symptoms. This study says that most common causes are CKD and use of Diuretics. And other possible causes seen are hypothyroidism, CVA, trauma and some are of unknown cause. In this study most commonly presenting symptoms are constipation (most common in Hypokalemia), nausea, vomiting, headache, confusion, weakness, dizziness and few patients are asymptomatic.

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Conflicts of Interest
There are no conflicts of interest.

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