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### A study on serum potassium abnormalities among patients in a tertiary care hospital

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#### ABSTRACT

##### Background

Hypokalemia and hyperkalemia are common electrolyte disorders seen in the medical ward. It is can be due to alteration in potassium intake, potassium excretion or transcellular shift. Potassium disorder can lead to life threatening cardiac conduction disturbances and neuromuscular dysfunction.

##### Aims and objectives

This study focuses on assessing the clinical profile of potassium abnormalities among patients admitted in medical wards of Saveetha Medical college Hospital, Chennai.

##### Materials and methods

A retrospective study was done among patients admitted in Saveetha medical college hospital during a period of 6 months from May 2016 to Oct 2016. A semi-structured questionnaire containing the socio-demographic variables was prepared. Bio chemical variable like serum potassium were taken into account and the data was analyzed using SPSS 11.5 version.

##### Results

The major causes of hypokalemia in our hospital are as follows: acute gastroenteritis 32%, diuretics 24%, alcohol dependence syndrome 20 %, diabetic ketoacidosis 12%, hypokalemic periodic paralysis 8% , infection 4% . Hyperkalemia causes in our medical ward are as follows: chronic kidney disease 56% , acute kidney injury 20%, angiotensin converting enzyme 12% , angiotensin receptor blocker 8% , potassium sparing diuretics 4% .

##### Conclusion

This study emphasizes the common causes of potassium abnormalities among the patient admitted in medical wards. The most common cause of hyperkalemia and hypokalemia in our hospital is chronic kidney disease and acute gastroenteritis respectively. Hyperkalemia and hypokalemia is one of factors to cause cardiac arrhythmia, thus routine measurement of serum potassium is warranted in all the patients admitted in ward for early detection of any possible derangements.

**Keywords:** Hypokalemia, Hyperkalemia, Dyselectrolytemia, Electrolytes.

## INTRODUCTION

Potassium is an important ion in the body, which is required for the functions of cells, especially nerve and muscle cells. In medical practice one of the most common electrolyte disorders encountered is abnormal potassium metabolism resulting in either hypokalemia or hyperkalemia. In a normal person, potassium balance is taken by oral intake and renal excretion. Daily normal intake of potassium is 40-100meq, urinary excretion varies between 40-90meq in 24hours. Only small amount of K<sup>+</sup> is excreted through fecal and sweating, anyway large amount of potassium wasting can occur in individual with severe sweating or gastrointestinal disease.

Potassium excretion is regulated by renal functions, total body potassium content, acid base balance, delivery of sodium to distal nephron and mineralocorticoid secretion. Condition associated with decreased potassium excretion are acidosis, less total body potassium content, sodium delivery to distal nephron decreased, mineralocorticoid secretion insufficiency. In contrast condition favouring increased potassium excretion are alkalosis, increased total potassium content, increased urinary sodium excretion and excess of mineralocorticoid secretion.

## MATERIALS AND METHODS

This is a retrospective study conducted on patients who got admitted in medical ward in tertiary care hospital over a period of 6 months. Blood samples and arterial blood gas analysis,

urine analysis reports collected. 25 patients of hyperkalemia and 25 patients of hypokalemia were taken in the study. The data was collected and analyzed using SPSS software 11.5 version.

## RESULTS

Out of patients admitted in medical ward during the period of study, 50 patients had potassium abnormalities of which 25 patients had hypokalemia and 25 patients had hyperkalemia. Among 25 patients with hypokalemia, 14 patients were diabetic and 11 patients were non diabetic. In those 25 hypokalemic patients, the cause for hypokalemia were acute gastroenteritis 32%, diuretic use 24%, alcoholic dependence 20%, diabetic ketoacidosis 12%, hypokalemic periodic paralysis 8 %, Infection 4 %. Out of this 25 patient with hypokalemia, 32 % patient had alkalosis and 12 % patient had acidosis. Hypomagnesemia noted in 11 patients with hypokalemia. Among 25 patients, one patient had hypokalemia, hypomagnesemia, hypocalcemia and alkalosis, features suggestive of Gitelmanns syndrome.

The cause of hyperkalemia in those 25 patients were chronic kidney disease 56% , acute kidney injury 20%, angiotensin receptor blocker 12% , angiotensin converting enzyme 8% , potassium sparing diuretics 4%. Among the hyperkalemia patients, 12 patients were diabetic and 13 patients were non diabetic, 14 patients had acidosis and 2 patients had alkalosis.

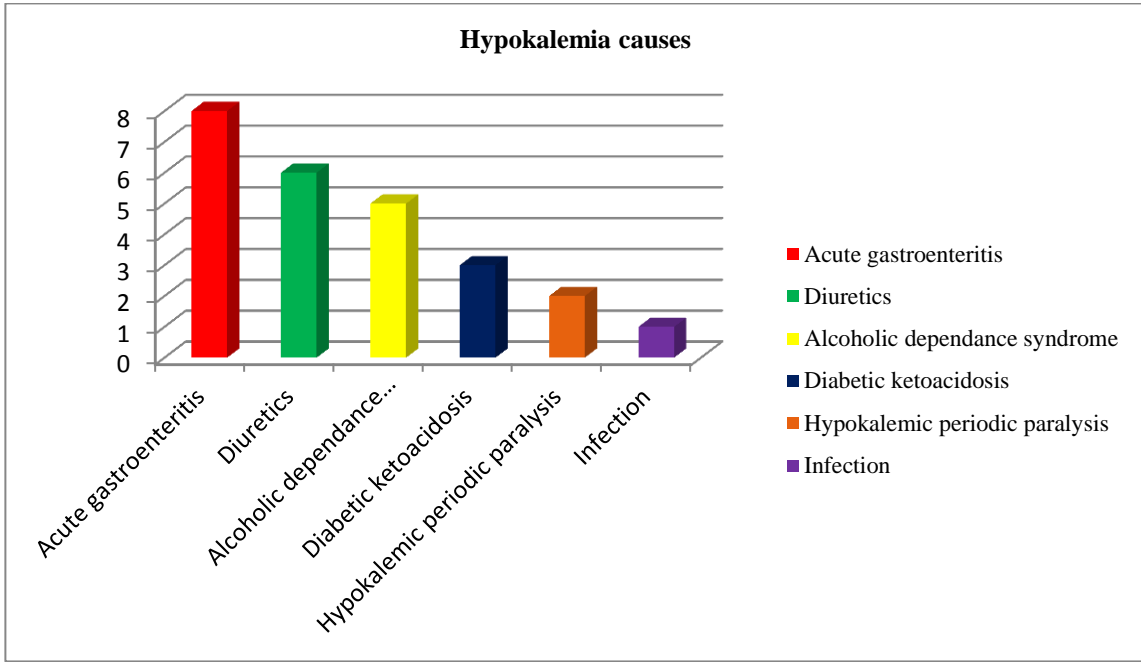


Figure 1: Frequency distribution of hypokalemia causes

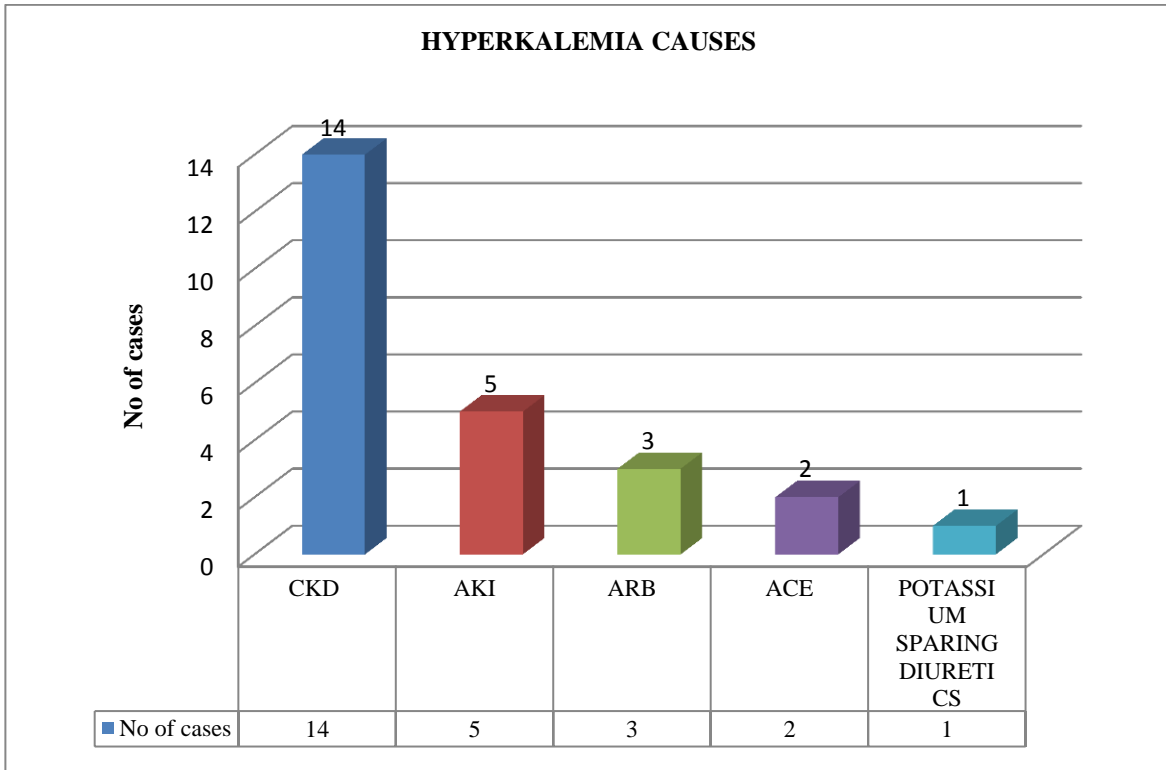


Figure 2: Frequency distribution of Hyperkalemia causes

**Table 1: Correlation between diabetic and non diabetic in patient with potassium abnormality**

	<b>HYPERKALEMIA N=25</b>	<b>HYPOKALEMIA N=25</b>
DIABETIC	12	14
NON DIABETIC	13	11

## DISCUSSION

The present study was conducted in a tertiary care hospital, over a period of 6 months with aim of studying the potassium abnormalities in medical ward. In our study most of cases presented with potassium abnormalities are male compared to female.

In present study, the most common cause of hypokalemia is acute gastroenteritis 32 % , which correlates with study done by Bela et al [1] (51%) and Niharpatel et al [2] (39%).24% percent of patients receiving diuretic in this study developed serum potassium levels between 2.5 and 3.4 mEq/L which correlates with the study done by John W.Hollifield and Paul E. Slaton [3] (23%) and Anil N.Makam et al [4] (47%). In chronic alcoholic, hypokalemia is considered to be common electrolyte abnormalities. In our study, 20 % patient had hypokalemia due to chronic alcoholic, which correlates with the study done by Elisaf et al [5] During the treatment of diabetic ketoacidosis, hypokalemia is more common, but hypokalemia prior to insulin treatment is exceedingly uncommon. In our study, 12% patients had hypokalemia in diabetic ketoacidosis prior to insulin treatment, which correlates with study done by Sanjay arora et al [6] (5.6%). Hypokalemic periodic paralysis is caused by mutation in the SCN4A, CACNA1S or KCNJ18 gene. In our study 8% had hypokalemic periodic paralysis. Dengue infection leads to mild hypokalemia due to poor intake and an increase in renal excretion due to activation of rennin – angiotensin aldosterone secondary to volume depletion. In our study, 4% patient had hypokalemia due to dengue fever.

Hyperkalemia is most common electrolyte abnormalities in the patient with chronic kidney disease. Hyperkalemia is of great concern in patients with CKD because of its adverse cardiac outcomes. Impaired eGFR associated with high dietary potassium intake relative to residual renal function, extracellular shift of potassium caused

commonly by metabolic acidosis of renal failure. In this present study, 56 % patient with chronic kidney disease had hyperkalemia, which correlates with study done by Lisa m et al [7] . In patient with acute kidney injury, hyperkalemia is due to impaired GFR and tubular flow; often accompanied by a hyper catabolic state and tissue injury, high acute potassium loads. In our study 16% patients had hyperkalemia due to acute kidney injury which correlates with study done by Francesco f et al [8] . Patient who had treated with RAAS inhibitors , such as angiotensin converting enzyme or angiotensin receptor blockers is linked with an increased risk of hyperkalemia. In our study 12 % patients and 8% patient had hyperkalemia due to ARB and ACE inhibitors respectively. By inhibiting formation of circulating angiotensin II or blocking angiotensin II binding to the adrenal receptor, ACEi or ARB, respectively, interfere with the stimulatory effect of angiotensin II on aldosterone secretion in the adrenal gland and as a consequence impair kidney excretion of potassium. In our study 4%patient had hyperkalemia due to potassium sparing diuretics. The incidence of hyperkalemia associated with use of potassium-sparing diuretics has risen since adding spironolactone to standard therapy was shown to reduce morbidity and mortality in patients with congestive heart failure.

Patients with diabetes had hypokalemia due to following reasons redistribution of K<sup>+</sup> from extracellular fluid compartment to intracellular fluid compartment, gastrointestinal loss of potassium due to malabsorption syndromes (diabetic induced motility disorders, bacterial overgrowth), renal loss of potassium (due to osmotic diuresis) [9] . In our study, patient with diabetes presenting with potassium abnormality comparing with non diabetic patients was statistically non significant.

## CONCLUSION

This study emphasizes the common causes of potassium abnormalities among the patient admitted in medical wards. In our study, most common cause of hyperkalemia and hypokalemia in

medical ward is chronic kidney disease and acute gastroenteritis. Hyperkalemia and hypokalemia is one of factors to cause cardiac arrhythmias, the routine measurement of serum potassium is thus warranted in all the patients admitted in ward for early detection of any possible derangements.

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