Original Article

Serum Potassium Level Derangements in Patients with Acute Coronary Syndrome

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ABSTRACT

Objective: To determine frequency of derangement of serum potassium levels in Acute coronary syndrome at a tertiary care hospital.

Study Design: Cross sectional study.

Place and Duration of Study: This study was conducted at the Department of Medicine, Nishtar Hospital, Multan from January 2016 to May 2017.

Materials and Methods: A total of 135 patients with ACS were recruited in this descriptive cross – sectional study. History regarding diabetes, hypertension and obesity was noted and serum potassium levels were checked and the data was analyzed by using SPSS version 20.

Results: Of these 135 study cases, 57 % were male patients while 43 % were female patients. Mean age of our study cases was noted to be 54.66 ± 8.76 years. Diabetes was present in 47 (34.8%) patients, hypertension in 62 (45.9%), obesity in 43 (31.9%), smoking in 36 (26.7%) and family history of ACS was positive in 36 (26.7%) of our study cases. Mean disease duration was noted to be 8.21 ± 3.14 hours.

Conclusion: Hypokalemia is a common clinical presentation in patients with acute coronary syndrome as higher frequency of hypokalemia has been noted in our study. Hypokalemia was significantly associated with diabetes, obesity and smoking. All clinicians treating such patients much check their serum potassium levels on regular basis to correct its deficiency timely to avoid adverse clinical outcomes such as ventricular arrhythmias

Key Words: Hypertension, acute coronary syndrome, diabetes.

INTRODUCTION

Acute coronary syndrome (ACS) is one of the most commonly encountered, catastrophic cardiac emergency. Acute coronary syndrome has been reported to be the major cause of morbidities and mortality in developing countries. Among hospitalized patients having ST segment elevation myocardial infarction (STEMI), it leads to 13.5% mortality during their hospitalization[1]. Acute coronary syndrome patients are at increased risks of adverse clinical outcomes and it is reported to be the leading cause of death in United Kingdome. The underlying factors which lead to poor prognosis in patients with ACS may include such as; increasing age, higher values of troponin T level, left ventricular dysfunction, severity of ECG changes, anemia, diabetes, heart failure, heart rate, deranged serum electrolytes, renal impairment and arrhythmias [2].

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Among patients having ACS, derangements in serum potassium (K) levelshave been reported in different studies with special emphasize on its decreasing levels,[3-6]. This decrease in potassium levels has been reported to be one of the major factors for increasing the risks for adverse cardiac events which may include potentially life threatening ventricular arrhythmias.[7-9] Furthermore decrease in potassium levels usually leads to vasoconstriction[10] that may further causeischemia of myocardium and hence giving rise to destructive vicious cycle[11,12]. Underlying mechanism of Hypokalemia may be the systemic sympathetic nerve system activation in ACS that can be activated by ischemic stress, and elevated catecholamines stimulate Na^+/K^+ATPase primarily via β2-adrenergic receptor.[13] Sekiyama H et al[14] suggests that the degree of Hypokalemia indicates the severity of acute ischemic stress, thus indicating significance of monitoring K level in parallel with glucose level in patients with ACS, especially in severe cases.Pain relief, rest and correction of hypokalemia may prevent cardiac associated with acute coronary syndrome.[11]Potassium replacement may have beneficial effects on ischemia-induced alterations and myocardial metabolism thus reducing the rate of complications and mortality.[15]

No such published study could be found from Pakistan on this topic and ourresults highlight magnitude of the

problem in our population. This may lead to the timely diagnosis and treatment of these patients to prevent them from cardiac morbidities once hypokalemia is corrected timely to decrease disease morbidity of our patients.

MATERIALS AND METHODS

Consecutive 135 patients diagnosed with Acute coronary syndrome (ACS) according to operational definition and fulfilling inclusion in Accident and Emergency Department, Department of Medicine, Nishtar Hospital Multanwere included in the study. ACS was defined as the presence of any two of the following three criteria; "History of central chest pain radiating to left arm of at least 30 minutes as described by patient, Typical ECG changes (i.e. ≥ 0.1 mV ST elevation in at least one standard lead or two precordial leads, ≥ 0.1 mV ST depression in at least two leads, abnormal Q waves, or T-wave inversions in at least two leads.), Positive Cardiac Enzymes, Labeled positive when any of following two is present, Trop-T kit test positive and CK-MB > 2 times of upper limit of normal value" while patients with Patients with renal failure, liver cirrhosis and bleeding disorders, pregnant ladies confirmed on urine pregnancy test, patients having malignancies were excluded from our study.

Complete history regarding chest pain was acquired by researcher himself. Once included in our study, 3 ml of venous blood sample was taken and sent to the Central laboratory of the Nishtar Hospital Multan for serum Potassium level estimation. The test was performed by the Senior Pathologist having 5 years of experience after post-graduation to determine serum potassium levels derangements in these patients. Hypokalemia and Typical ECG changes were labeled keeping in view the operational definitions. History regarding diabetes, hypertension and smoking was taken. Data were entered and analyzed using computer program SPSS-16, mean and standard deviation for age of the patient, duration of ACS, and serum potassium level were calculated. For categorical variables like gender, obesity, age groups, diabetes, hypertension, smoking, family history of ACS, Hypokalemia and Positive Cardiac Enzymes frequency and percentages were calculated. Confounders like age, obesity, diabetes, hypertension and gender were controlled by stratification with help of chi-square test as 0.05 level of significance.

RESULTS

Our study comprised of a total of 135 study cases with ACS who met inclusion criteria of our study. Of these 135 study cases, 57 % were male patients while 43 % were female patients. Mean age of our study cases was noted to be 54.66 ± 8.76 years Diabetes was present in 47 (34.8%) patients, hypertension in 62 (45.9%), obesity in 43 (31.9%), smoking in 36 (26.7%) and

family history of ACS was positive in 36 (26.7%) of our study cases. Cardiac enzymes were positive in 83 (61.5 %) of our study cases. Mean disease duration was noted to be 8.21 ± 3.14 hours. Mean serum potassium level was noted to be 3.24 ± 0.78 mEq/L and hypokalemia was present in 53 (39.3%) patients.

Table No. 1: Stratification of hypokalemia with regards to gender.   (n = 135)

Gender	Hypokalemia		P - value
	Yes (n = 53)	No (n = 82)	
Male (n = 77)	30	47	1.00
Female (n = 58)	23	35	
Total	135		

Table No. 2: Stratification of hypokalemia with regards to age.   (n = 135)

Age groups	Hypokalemia		P - value
	Yes (n = 53)	No (n = 82)	
35 – 55 yrs (n = 82)	35	47	0.368
56 – 70 yrs (n = 53)	18	35	
Total	135		

Table No. 3: Stratification of hypokalemia with regards to diabetes.   (n = 135)

Diabetes	Hypokalemia		P - value
	Yes (n = 53)	No (n = 82)	
Yes (n = 47)	30	17	0.000
No (n = 88)	23	65	
Total	135		

Table No. 4: Stratification of hypokalemia with regards to hypertension. (n = 135)

Hypertension	Hypokalemia		P – value
	Yes (n = 53)	No (n = 82)	
Yes (n = 62)	27	35	0.380
No (n = 73)	26	47	
Total	135		

Table No. 5: Stratification of hypokalemia with regards to obesity. (n = 135)

Obesity	Hypokalemia		P - value
	Yes (n = 53)	No (n = 82)	
Yes (n=43)	31	12	0.000
No (n = 92)	22	70	
Total	135		

DISCUSSION

Acute coronary syndrome (ACS) is related to wide range of conditions describing myocardial ischemia which may include ST elevated or non-ST elevated myocardial infarction (MI) and unstable angina[15-17]. ACS is associated with significant increase in substantial morbidity and mortality among sufferers and can pose an extra financial burden on the suffering families as well as health care system of the country, especially in developing countries. This study was done to ascertain derangement of serum potassium levels in patients with acute coronary syndrome as there is no such study done in our local population. Our study comprised of a total of 135 study cases with ACS who met inclusion criteria of our study. Of these 135 study cases, 57 % were male patients while 43 % were female patients. Many different studies done have reported male gender predominance which are similar to our findings. A study conducted by Ahmed et al [18] from Abbottabad also reported 64 % male gender preponderance. Ashraf et al [19] from Peshawar also reported male gender predominance with 58 % male patients. Mujtaba et al [20] from Karachi has reported male gender predominance with 53 %. A study conducted at Shifa International Hospital of Islamabad also documented male to female ratio was 3:1 showing high male gender predominance[21].

Mean age of our study cases was noted to be 54.66 ± 8.76 years. Mean age of the male patients was noted to be 53.92 ± 9.61 years while that of female patients was noted to be 55.64 ± 6.82 years (p = 0.262). A study conducted by Ahmed et al [18] from Abbottabad also reported mean age of these patients was 57.75 years. Zaidi et al [22] from Rawalpindi also reported similar results. Ashraf et al [19] from Peshawar also reported male patients were younger than female patients which is similar to that of our study results. Mujtaba et al [20] from Karachi has reported 55.36 years mean age of the patients with ACS which is close to our study results. Bhalli et al [23] from Rawalpindi also reported male patients with mean age 54.26 ± 11 years.

Diabetes was present in 47 (34.8%) our patients with ACS. A study conducted by Ahmed et al [18] from Abbottabad also reported 31.6 % patients with ACS had diabetes. Zaidi et al [22] from Rawalpindi also reported diabetes in 37 % patients with ACS. Ashraf et al [19] from Peshawar also reported that diabetes was major risk factor for ACS. Bhalli et al [23] from Rawalpindi also reported 43 % diabetes which is close to our study results.

Hypertension was present in 62 (45.9%) our patients. Zaidi et al [22] from Rawalpindi also reported 45%. Ashraf et al [19] from Peshawar also reported similar results. Another study from CMH Abbottabad[24] also reported hypertension in 37 %.

Obesity was present in 43 (31.9%), smoking in 36 (26.7%) and family history of ACS was positive in 36 (26.7%) of our study cases. In our study all smokers were male patients and none of female patients gave history for smoking. A study from CMH Abbottabad [24] also reported similar results. Same study from CMH Abbottabad [24] also reported BMI more than 25 kg/m^2 in 37.8 % patients. Butt et al [25] from Lahore also reported 34 % smoking and all smokers were male patients which is in compliance with our study results.

Cardiac enzymes were positive in 83 (61.5 %) of our study cases. Mean disease duration was noted to be 8.21 ± 3.14 hours. Mean serum potassium level was noted to be 3.24 ± 0.78 mEq/L and hypokalemia was present in 53 (39.3%) patients. A study conducted in Poland by Maciejewski et al[12] also reported 34 % hypokalemia in patients with acute coronary syndrome. Some other studies in patients with MI have also reported hypokalemia being common as well.

CONCLUSION

Hypokalemia is a common clinical presentation in patients with acute coronary syndrome as higher frequency of hypokalemia has been noted in our study. Hypokalemia was significantly associated with diabetes, obesity and smoking. All clinicians treating such patients much check their serum potassium levels on regular basis to correct its deficiency timely to avoid adverse clinical outcomes such as ventricular arrhythmias.

Author's Contribution:

Concept & Design of Study: Amna Sadiq
Drafting: Ghoza Chaudhery & Shahzad Alam Khan
Data Analysis: Shahzad Alam Khan & Farrukh Masood
Revisiting Critically: Amna Sadiq
Final Approval of version: Amna Sadiq & Farrukh Masood

Conflict of Interest: The study has no conflict of interest to declare by any author.

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