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ORIGINAL ARTICLE

Frequency of Hypokalemia in Patients with Acute Myocardial Infarction Admitted to the Cardiology Unit of Peshawar Institute of Cardiology, Hayatabad

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ABSTRACT

Objective: To determine the frequency of hypokalemia in patients with acute myocardial infarction admitted to the cardiology unit of Peshawar Institute of Cardiology, Hayatabad.
Study design: Cross sectional descriptive study.
Setting: Cardiology Department, Peshawar Institute of Cardiology, Hayatabad.
Duration of study: 6 months (05 August, 2020 to 05 February, 2021)
Material & Methods: In the present study a total of 217 patients were observed. Detail history, routine investigation i.e. ECG was done for the confirmation of acute myocardial infarction. From all the patients, 5cc of venous blood was obtained and sent to hospital laboratory to detect hypokalemia. All the laboratory investigations were done under supervision of same consultant pathologist having minimum of five years of experience. hypokalemia was considered positive if the serum potassium concentration is < 3.5 mmol/L on serum electrolyte levels.
Results: In this study mean age was 68 years with standard deviation ± 8.04. 132(61%) patients were male while 85(39%) patients were female. Hypokalemia was analyzed as 20(9%) patients had Hypokalemia and 197(91%) patients didn't had Hypokalemia.
Conclusion: Our study concludes that the frequency of hypokalemia was 9% in patients with acute myocardial infarction admitted to the Cardiology Department, Peshawar Institute of Cardiology, Hayatabad.
Keywords: Hypokalemia, Diabetic Mellitus, Hypertension, Smoking, Acute Myocardial Infarction

INTRODUCTION

For those unfamiliar, acute myocardial infarction is just one symptom of the broader spectrum of coronary artery disease known as acute coronary syndrome. According to global estimates, acute myocardial infarction (acute MI) is one of the leading causes of death and disability [1]. Around 3 million people die suddenly from cardiac causes every year due to acute MI, according to reports [1]. One study estimates that there will be 785,000 new MIs in the US each year [2]. Additionally, MI is a significant financial and human resource drain on healthcare systems worldwide, including in developed and developing nations. The rising rates of acute myocardial infarction can be traced back to several variables, including rising life expectancy in developing countries and improved access to healthcare and diagnostic services around the world.

Several electrolyte abnormalities have been linked to acute myocardial infarction [1, 2]. There is some dispute as to whether acute MI causes these electrolyte abnormalities or if they are a result of acute MI. However, researchers and clinicians who keep close tabs on MI patients' serum electrolyte levels have noticed a correlation. Since these electrolytes make up the bulk of cardiac membrane electrophysiology [1], they play a pivotal role in this context.

It is believed that electrolyte imbalances and autonomic nervous system activity are primarily responsible for the sudden cardiac death that occurs after an acute MI (death within 1 hour) through altering the environment at the level of myocytes and purkinje fibres [1]. Acute myocardial infarction is associated with an imbalance in potassium homeostasis, which has been linked to increased morbidity and death. Though both hypokalemia and hyperkalemia have been linked to increased in-hospital and long-term mortality and morbidity in MI patients [1, 3,4], hypokalemia has been more commonly linked to ventricular tachycardia and fibrillation while hyperkalemia has been more commonly linked to ventricular pauses and cardiac arrest. Although the exact mechanism by which potassium exerts its effect on these arrhythmias in MI is unclear, it is thought to have something to do with potassium's role in the membranes of myocytes [3].

The normal range for serum potassium is 3.5-7 mmol/L. Hypokalemia is defined as serum potassium levels below 3.5 mmol/L, whereas hyperkalemia is defined as serum potassium levels above 5 mmol/L. Estimates place the total amount of potassium in the body at 3500 mmol [1], with 98% of that found inside the cells. Extracellular potassium homeostasis is primarily regulated by aldosterone and vasopressin on kidneys, while cellular potassium homeostasis is maintained by the activity of sodium potassium ATPase [1]. Hypokalemia is hypothesised to enhance the automaticity and excitability of myocardial cells, which in turn raises the predisposition for ventricular arrhythmias because potassium is primarily engaged in the repolarization phase of the cardiac action potential. Chronic hypokalemia has been a focus of studies and surveillance of hospitalised patients with acute myocardial infarction. serum potassium levels should be kept within normal limits, often between 4 and 4.5 mmol/L [5, 6, 7], as recommended by guidelines. The incidence of hypokalemia in the context of acute myocardial infarction has been reported anywhere from 7.5% to 24.0% [1] by researchers all over the world.

This study seeks to determine the prevalence of hypokalemia following myocardial infarction in our population in light of the growing incidence and prevalence of myocardial infarction and associated consequences in the acute situation. As of yet, we haven't done any research to determine the prevalence in our community's hospital population. The local doctors would be better able to treat their patients if they are aware of the prevalence of this issue among their patients. As a result, they will be ready for it and will be able to make an earlier diagnosis, both of which will lead to improved care and results for their patients.

MATERIALS AND METHODS

This cross-sectional study was conducted at Cardiology Department, Peshawar Institute of Cardiology, Hayatabad. Duration of study was 6 months, from 5/8/2020 to 5/1/2021. A total 217 patients presenting with acute myocardial infarction, patients in age range 30 to 75 years, either gender (Male/female) were included in the study. Patients with Cushing syndrome, polycystic ovarian syndrome, or ascites for any reason can be identified with a Renal Function test, a list of steroid users, an ultrasound of the abdomen, a chest x-ray, and other diagnostic tools. Analysis of urine R/E, blood pressure, and 24-hour urinary protein in patients

with nephrotic syndrome can help determine the cause of their severe protein loss. Excluded from the trial were patients who had previously used lipid-lowering medications and those who had a documented history of acute myocardial ischemia episodes.

In order to confirm an acute myocardial infarction, it was necessary to collect a thorough history and conduct standard investigations, such as an electrocardiogram. Five millilitres of venous blood was drawn from each patient and sent to the hospital lab to test for hypokalemia. The same consulting pathologist with at least five years of expertise oversaw all of the laboratory tests. If the serum potassium content is less than 3.5 mmol/L, then hypokalemia is present. Age, gender, MI type, BMI, hypertension, diabetes, smoking habits, marital status, occupation, and place of residence were all documented in a standard-issued data collection form. Study results were unbiased because exclusion criteria were properly adhered to.

All the proforma data was imported into SPSS 23 and descriptive analyses were run. Age, weight, height, and body mass index were among the continuous variables used to derive means and standard deviations. Categorical characteristics such as gender, type of MI, hypertension, diabetes mellitus, smoking, socioeconomic level, domicile, and hypokalemia were analysed to determine frequencies and percentages. Stratification by age, gender, type of MI, BMI, hypertension, diabetes mellitus, smoking, socioeconomic level, and place of residence allowed for a more nuanced look at the impact of hypokalemia. Significant results were found using a chi-square test performed after stratification, with a threshold of P 0.05.

RESULTS

Mean age was 68 years with standard deviation ± 8.04. Gender distribution was analyzed as 132 (61%) patients were male while 85 (39%) patients were female. Mean BMI was 27 Kg/m2 with SD ± 5.08. Smoking was analyzed as 80 (37%) patients were smokers and 137 (63%) patients were non-smokers. Hypertension was analyzed as 169 (78%) patients were hypertension and 48 (22%) patients were non hypertensive. Diabetes mellitus was analyzed as 126 (58%) patients were diabetic and 91 (42%) patients were non diabetic. (Table No 1)

Table 1: Baseline characteristics of all the included patients

Variables	Frequency No.	%age
Mean Age (Years)	68±8.04	-
Mean BMI (Kg/m)	27±5.08	-
Gender		
Male	132	61%
Female	85	39%
Smoking Status		
Yes	80	37%
No	137	63%
Co-morbidities		
HTN	169	78%
Diabetes Mellitus	126	58%

Type of MI was analyzed as 152 (70%) patients had STEMI and 65 (30%) patients had NSTEMI. (Figure No 1)

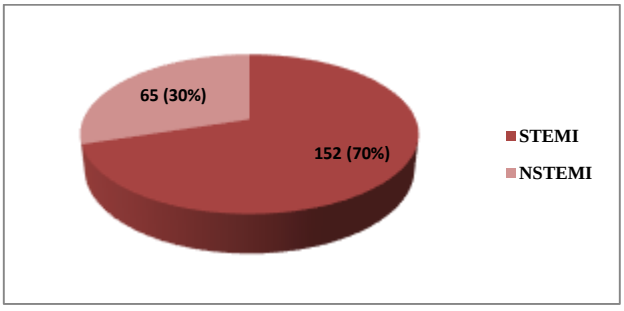

Figure 1: Types of Myocardial Infarction

Hypokalemia was analyzed as 20 (9%) patients had Hypokalemia and 197 (91%) patients didn't have Hypokalemia. (Figure No 2)

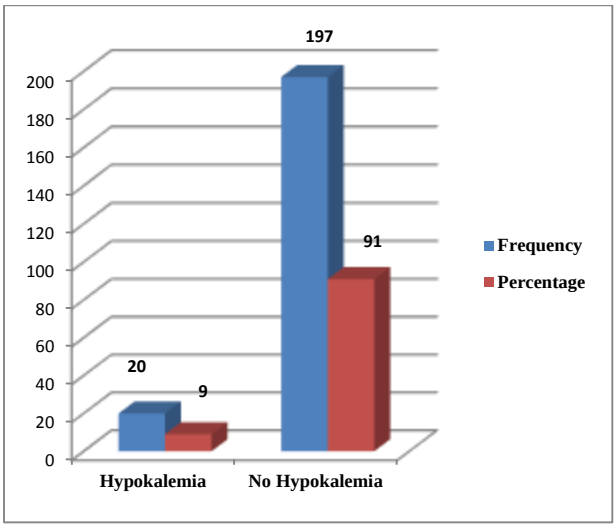

Figure 2: Frequency of Hypokalemia

Stratification of Hypokalemia with respect to age, gender, type of MI, BMI, hypertension, and diabetes mellitus were shown in table 2-8.

Table 2: Stratification Of Hypokalemia W.R.T Age

Hypokalemia	30- 40 years	41-60 years	61-75 years	Total
Yes	2	9	9	20
No	20	84	93	197
Total	22	93	102	217

P value was 0.9788

Table 3: Stratification Of Hypokalemia W.R.T Gender Distribution

Hypokalemia	Male	Female	Total
Yes	12	8	20
No	120	77	197
Total	132	85	217

P value was 0.9364

Table 4: Stratification Of Hypokalemia W.R.T Bmi

Hypokalemia	< 25 Kg/m2	> 25 Kg/m2	Total
YES	9	11	20
NO	86	111	197
Total	95	122	217

P value was 0.9080

Table 5: Stratification Of Hypokalemia W.R.T Smoking

Hypokalemia	Yes	No	Total
YES	7	13	20
NO	73	124	197
Total	80	137	217

P value was 0.8559

Table 6: Stratification Of Hypokalemia W.R.T Hypertension

Hypokalemia	Yes	NO	Total
YES	16	4	20
NO	153	44	197
Total	169	48	217

P value was 0.8105

Table 7: Stratification Of Hypokalemia W.R.T Diabetes Mellitus

Hypokalemia	Diabetic	Nondiabetic	Total
YES	12	8	20
NO	114	83	197
Total	126	91	217

P value was 0.8539

Table 8: Stratification Of Hypokalemia W.R.T Type Of Mi

Hypokalemia	Stemi	Nstemi	Total
YES	14	6	20
NO	138	59	197
Total	152	65	217

P value was 0.9962

DISCUSSION

Acute myocardial infarction is a subtype of acute coronary syndrome, which is a more general term referring to a spectrum of coronary artery disease. It is widely acknowledged that acute myocardial infarction (also known as acute MI) is one of the leading causes of death and disability all over the world [1]. It has been estimated that acute myocardial infarction is responsible for around 3 million sudden cardiac fatalities per year across the world [1]. According to the findings of one study, there will be an average of 785,000 new MIs diagnosed per year in the United States alone[2]. In addition, MI has significant physiological, psychological, and legal repercussions on individuals as well as on society as a whole, and it places a significant strain on the healthcare systems of both rich countries and poor countries around the world. This rising incidence and prevalence of acute myocardial infarction is not only attributable to the increased exposure of the population to various modifiable risk factors of MI, but it is also attributable to the increased life expectancy in the developing world and the increasing access to healthcare and diagnostic facilities all over the world. Both of these factors have contributed to the rise in incidence and prevalence of acute MI in recent years.

Our study shows that mean age was 68 years with standard deviation ± 8.04. 132(61%) patients were male while 85(39%) patients were female. Mean BMI was 27 Kg/m^2 with SD ± 5.08. 80(37%) patients were smokers and 137(63%) patients were nonsmokers. 169(78%) patients were hypertension and 48(22%) patients were non hypertensive. 126(58%) patients were diabetic and 91(42%) patients were non diabetic. Hypokalemia was analyzed as 20(9%) patients had Hypokalemia and 197(91%) patients didn't have Hypokalemia.

Similar results were observed in another study carried out by Patil S et al[8] in which the frequencies of hypokalemia in the setting of acute myocardial infarction, ranging from **7.5%** to 24%.[1]

Similar results were observed in another study carried out by Iqbal R et al[9] in which 197 patients were included, 55.3% males and 44.7% females. Mean age of the patients was 59.5±9.5 years. Serum potassium level ranged from 2.5 to 5.5 mmol/L and mean serum potassium level was 4.0 ± 0.3 mmol/L. Hypokalemia was recorded in 10.2% of patients.

Similar results were observed in another study carried out by Grodzinsky A et al[10] in which Of 38,689 acute myocardial infarction patients, 886 were on dialysis. The rate of hyperkalemia (max K ≥ 5.0 mEq/L) was 22.6% in non-dialysis and 66.8% in dialysis patients. Moderate-severe hyperkalemia (max K ≥ 5.5 mEq/L) occurred in 9.8% of patients. There was a steep increase in mortality with higher max K levels. In-hospital mortality exceeded 15% once max K ≥5.5 mEq/L regardless of dialysis status. The relationship between higher max K and increased mortality risk persisted after multivariable adjustment. In addition, patients with greater number of hyperkalemic values (vs. a single value) experienced higher in-hospital mortality.

CONCLUSION

Our study concludes that the frequency of hypokalemia was 9% in patients with acute myocardial infarction admitted to the cardiology unit of Cardiology Department, Peshawar Institute of Cardiology, Hayatabad.

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