EVALUATION OF ASSOCIATION BETWEEN POTASSIUM LEVELS WITH SEVERE ARRHYTHMIAS IN PATIENTS WITH ACUTE MYOCARDIAL INFRACTION

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Abstract

Background

Electrolytes plays major role in the cell function. Changes in electrolyte levels can affect the heart function. The present study aimed to evaluate the association between potassium levels with severe arrhythmias in patients with myocardial infraction.

Materials and Methods

This study was conducted in the department of Cardiology, SreeMookabika Institute of Medical Sciences, Kulasekharam, Kanyakumari (Dist), Tamil Nadu. A total of 125 patients were included in the study based on inclusion and exclusion criteria. They were divided into two groups. Group-I without arrhythmias 70 and group-II with arrhythmias 55. All the patients demographic, clinical and biochemical data was recorded. The data was expressed in mean and standard deviation. Statistical Package for Social Sciences (SPSS 20.0) version used for analysis.

Results

This study included total of 125 patients and divided into two groups. Comparison of mean age, BMI and gender distribution between the groups not showed any significant. Smoking, on beta-blockers, on-diuretics and potassium levels showed significant difference between the groups. Comparison of on beta blockers, on diuretics and potassium levels showed significant difference between supra ventricular and ventricular arrhythmias. Potassium levels >3.5 showed significant difference compared group-I with group-II.

Conclusion

This study concluded that potassium levels has significant role to develop arrhythmias in myocardial infraction patients.

Keywords: Arrhythmia**,** Potassium, beta-blockers, diuretics, BMI, ventricular arrhythmia.

Introduction

Cardiovascular system consists of heart and blood vessels. Based on poor life style, over stress and unhealthy food habits are the major causes for development of cardiovascular diseases. The major diseases of cardiovascular system are congestive heart failure, myocardial infraction, hypertension, angina, coronary heart diseases, arrhythmias, cardiomyopathy and

peripheral vascular diseases. All these diseases are interconnected. Pathophysiology of these diseases mainly changes heart conduction, vascular contraction and relaxation and electrolyte imbalance. Heart and blood vessels contraction and relaxation depend on the electrolyte levels. It was observed that abnormalities of cardiovascular system are associated with electrolyte imbalance. Sodium and calcium are involved in contraction and potassium and chloride are involved in relaxation. Changes in the electrolyte levels can lead to a significant cardiovascular disease. In heart impulse generate at sinus node distributed into the heart muscle by the AV node and bundle of his. The impulse generation depend on the electrolyte levels. Any changes in electrolyte entry at sinus node can produce the cardiac arrhythmias. These can cause the low cardiac output and oxygen insufficiency. According to the various studies arrhythmias are a common clinical feature in the various cardiac diseases. Another major disease related to cardiovascular system is myocardial infraction. It was observed that ventricular fibrillation and tachycardia are the most common symptoms in myocardial infraction. Patients with abnormal potassium and myocardial infraction can prone to arrhythmias. Many clinical studies showed that patients with abnormal potassium levels with myocardial infraction can develop arrhythmias which lead to mortality. With this background the present study aimed to evaluate the association between potassium levels with severe arrhythmias in patients with acute myocardial infraction.

Materials and Methods

Study design: Observational study

Study settings: The study was conducted in the department cardiology, SreeMookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari (Dist), Tamil Nadu.

Study period:

Inclusion criteria

- Both gender
- Myocardial infraction
- Developed ventricular and supra ventricular arrhythmia

Exclusion criteria

- Pregnant women
- Angina
- On calcium channel blockers, digoxin
- Alcoholics

Groups

A total of 125 patients were included in the study based on inclusion and exclusion criteria.

Group-I: Without arrhythmias (n=70)

Group-II: With arrhythmias (n=55)

Procedure

This study was conducted in the department of Cardiology, SreeMokambika Institute of Medical Sciences, Kulasekharam, Tamil Nadu. A total of 125 patients were included in the study based on inclusion and exclusion criteria. All the patients were informed about study procedure and informed consent was obtained. The patients were divided into two groups based on the development of arrhythmias. In this study 70 patients are not developed arrhythmias and 55 were developed arrhythmias. All the patients demographic, clinical and potassium level were recorded and analysed.

Statistical analysis

The data was expressed in number, percentage, mean and standard deviation. Statistical Package for Social Sciences (SPSS 20.0) version used for analysis. Unpaired t test and Chi square test applied to find the statistical significant between the groups. P value less than 0.05 considered statically significant at 95% confidence interval.

Results

This study included 125 patients which were divided into two groups. 70 patients not developed arrhythmias and 55 had arrhythmia. Patients without arrhythmia included in group-I and with arrhythmia included in group-II. Both groups mean age was 56-57. Comparison of mean age between the groups not showed any significant difference. 58 males were in group-I and 22 in group-II. Comparison of mean BMI between the groups not showed any significant difference with p value 0.93. 50 patients in group-I and 36 in group-II were smokers. 39 patients were on beta blockers ingroup-I and 22 in group-II. Comparison of drug medication between the groups showed significant difference. Group-II had low potassium level compared group-I which showed significant difference with p value 0.001. (Table-1). Group-II patients were subdivided based on type of arrhythmia. 30 were developed supra-ventricular and 25 ventricular arrhythmias. Comparison of age, gender, BMI and smokingnot showed any significant difference compared Group-I with supra-ventricular and ventricular arrhythmia. There is significant difference compared on beta blockers, on diuretics and potassium level showed significant difference compared group-I with type of arrhythmias. (Table-2) Patients with potassium levels less than 3.5 showed significant difference compared between group-I and II. (Table-3).

Discussion

Hypokalemia usually associated with muscle weakness and abnormalities of cardiac rhythm. The main reasons for hypokamlemia is loss of potassium in urine, reduce the dietary intake and decrease the absorption. Decreased potassium levels can cause the dynamic changes in T wave, QT interval, prominent U wave and mild ST segment changes in ECG. If hypokalaemia persist long time can cause the development of arrhythmia, atrial fibrillation, atrial flutter, supraventricular tachycardia and ventricular fibrillation which can be life threatening. According to review of literature development of arrhythmias are significantly associated with potassium level. Phillios et.al conducted a longitudinal, multicentre retrospective cohort study that showed that hypokalaemia<3.5 mmol/L was associated with an increased risk of medically treated arrhythmia in intensive care unit patients. The Rotterdam study concluded that hypokalemia is one of the factor can induce the atrial fibrillation in patients with myocardial infarction. Previous studies showed development of arrhythmias with hypokalemia in myocardial infarction patients is common. H Kafka studied the relationship

between the serum potassium levels in acute myocardial infarction and cause of ventricular arrhythmias. In this study patient with myocardial infarction and arrythmais showed low potassium levels compared to others. The study results concluded that there is a 59% change to get arrhythmias in patients with hypokalemia and myocardial infarction. Mia RJ et.al study results showed that hypokalemia is associated with increased risk of ventricukar fibrillation in early phase of STEMI. In the present study also showed similar effects. Patients with myocardial infraction and arrhythmias had low potassium levels compared to non-arrhythmic group.

Conclusion

The present study concluded that potassium levels have significant relation with development of arrhythmias in patients with myocardial infraction. The severity various depend on the patient's co-morbid conditions. Monitoring and adjusting the potassium levels in myocardial patients can reduce the development of arrhythmias.

Conflict of interest: Nil

Funding: Self

References

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Table-1: Comparison of demographic and biochemical parameters between the groups

Observations	Group-I (MEAN±SD)	Group-II (MEAN±SD)	p value
Age (Years)	56.90±2.93	57.34±2.17	**0.45**
Gender (Male)	58 (82.85)	42 (76.36)	**0.59**
BMI (kg/m$^{2)}$	25.45±1.23	24.94±1.62	**0.72**
Smoking	50 (71.42)	36 (65.45)	**0.05***
On beta-blockers	39 (55.71)	22 (40.00)	**0.04***
On diuretics	43 (61.42)	28 (50.90)	**0.05***
Potassium (mmol/L)	4.56±0.92	3.62±0.83	**0.001***

(*p<0.05 significant)

Table-2: Comparison of demographic and biochemical parameters between the group-I and sub-divisions of group-II

Observations	Group-I (MEAN±SD)	Group-II (MEAN±SD)		p value
		Supra-ventricular	Ventricular	
Age (Years)	56.90±2.93	57.34±2.17	56.95±1.67	**0.78**
Gender (Male)	58 (82.85)	22 (73.33)	8 (53.33)	**0.52**
BMI (kg/m$^{2)}$	25.45±1.23	24.1.34±1.23	24.34±1.93	**0.93**
Smoking	50 (71.42)	35 (70.00)	12 (80.00)	**0.08**

On beta-blockers	39 (55.71)	23 (76.67)	13 (86.67)	**0.006**
On diuretics	43 (61.42)	22 (40.00)	10 (66.67)	**0.05**
Potassium (mmol/L)	4.56±0.92	3.93±0.82	3.42±0.73	**0.0001***

(*p<0.05 significant)

Table-3: Association between the risk of arrhythmias with hypokalaemia

Potassium levels	Group-I (n=70)	Group-II (n=55)_	Supraventricular arrhythmias	Ventricular arrhythmias	p value
Q1 (>3.5)	10	8	5	3	**0.001***
Q2 (3.5-4.2)	32	28	16	12	**0.84**
Q3 (4.3-5.1)	13	10	7	3	**0.91**
Q4 (>5.1)	15	9	8	1	**0.82**

(*p<0.05 significant)