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Cardiology

PROGNOSTIC IMPORTANCE OF HYPONATREMIA IN ACUTE ST-ELEVATION MYOCARDIAL INFARCTION

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ABSTRACT

Background: Hyponatremia has been shown to be a predictor of cardiovascular mortality among patients with heart failure. In fact, the neurohormonal activation that accompanies acute myocardial infarction is similar to that which accompanies heart failure.

Aims And Objectives : To find out the prognostic importance of hyponatremia in acute ST elevation myocardial infarction.

Material And Methods: 100 consecutive patients presenting with acute ST-elevation myocardial infarction admitted to N.R.I Medical college and General hospital from March 2019 to March 2020 were studied. Qualifying patients underwent detailed history and clinical examination. Plasma sodium concentrations were obtained on admission and at 24, 48 and 72 hours thereafter. The primary end point was all cause mortality within 30 days following myocardial infarction.

Results: In our study, substantial proportion of patients who presented with acute ST elevation myocardial infarction were hyponatremic on admission or developed hyponatremia shortly after admission. The odd's ratio for 30-day mortality was found to be high in the hyponatremic groups compared to normal group. We also found a significant linear relationship between severity of hyponatremia and mortality. Multivariate analysis was performed which identified hyponatremia on admission or early development of hyponatremia as a significant independent predictor of 30 day mortality.

Conclusion: In our study we concluded that hyponatremia on admission or early development of hyponatremia in patients with acute ST elevation myocardial infarction is an independent predictor of 30-day mortality. Plasma sodium levels may serve as a simple marker to identify patients at risk.

KEYWORDS : Acute myocardial infarction, Hyponatremia

INTRODUCTION

Myocardial infarction is a well known clinical entity. It is one of the most fatal diseases which is world wide in distribution, affecting all races and nationalities. Hyponatremia is a common electrolyte disorder among hospitalized patients especially in postoperative period and in patients with heart failure, nephrotic syndrome or cirrhosis [1,2]. Hyponatremia has been shown to be a cardiovascular predictor of mortality among patients with heart failure [3,6]. In fact, the neurohormonal activation that accompanies acute myocardial infarction is similar to that which accompanies heart failure [4]. However, the prognostic value in hyponatremia in chronic heart failure is well established. Data on the prognostic importance of hyponatremia in the setting of acute myocardial infarction are lacking. This study was done to determine the prognostic importance of hyponatremia in the setting of acute ST elevation MI and to determine its usefulness in predicting short term survival.

AIMS AND OBJECTIVES

To find out the prognostic importance of hyponatremia in acute ST elevation myocardial infarction.

MATERIALS AND METHODS

100 patients presenting with acute ST-elevation myocardial infarction admitted to NRIGH HOSPITAL for a duration of 1 year were studied.

Inclusion Criteria

All acute myocardial infarction patients having
a) Chest pain lasting more than 20 minutes
b) Diagnostic ECG changes consisting of new pathological Q waves or ST segment and T wave changes.
c) Elevated creatinine kinase MB levels or cardiac tropinin T levels.

Exclusion Criteria

a) Acute coronary syndrome without ST elevation. Qualifying patients underwent detailed history and clinical examination. Patients of acute myocardial infarction received thrombolytic therapy (tissue type plasminogen activator or streptokinase) were taken. Hyponatremia was defined as sodium level less than 135mmol/L (<135 mEq/L). Plasma sodium concentrations were obtained on admission and at 24, 48 and 72 hours thereafter. Plasma sodium concentrations were determined by using an ion selective electrode auto analyzer. The primary end point was all cause mortality within 30 days following myocardial infarction.

Mortality data after discharge but within 30 days of myocardial infarction were obtained by postcard returned by patients or their families or over telephone.

Statistical Method

1. Odd 's ratio
2. Suitable parametric and non parametric tests
3. Chi square test for non continuous variables, Analysis of variance for continuous variables
4. Univariate and multivariate logistic regression tests to determine the association between hyponatremia and 30 day mortality.

RESULTS:

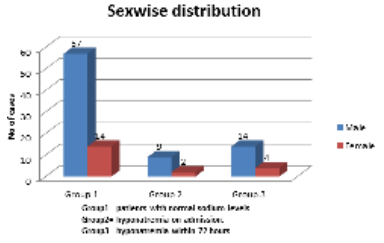

Fig 1:

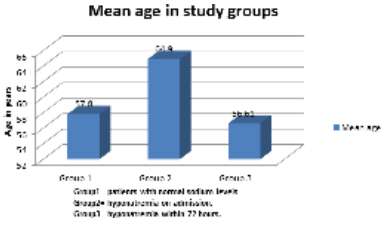

Fig 2:

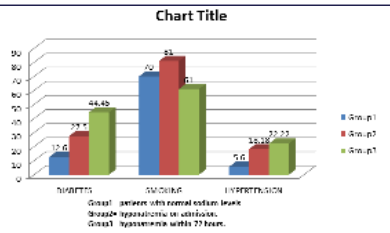

Fig 3 :

Table 1: Base Line Characteristics Of 100 Patients

Characteristics	Normal sodium level(n=71)	Hyponatremia on Admission (n=11)	Hyponatremia within 72 hrs (n=18)	P value
	MEAN ±SD, NUMBER (%) OR MEDIAN			
Age(yrs)	57.8±11.7	64.9±13.1	56.61±11.54	F=1.97 P=0.145
Male Sex	57(71)	9(81)	14(77)	χ^2=0.082 p=0.962
Diabetes	9(12.6)	3(27.5)	8(44.45)	χ^2=9.466 p=0.009
Smoking	50(70)	9(81)	11(61)	χ^2=4.938 p=0.0085
Hypertension	14(5.6)	2(18.18)	4(22.22)	χ^2=0.082 p=0.960
Anterior Infarction	45(63)	8(72)	15(83)	χ^2=2.754 p=0.252
Ejection Fraction (%)	44.63±11.19	40.36±6.14	50.11±13.26	F=2.86 p=0.06

Patients presented with hyponatremia on admission were older than patients with normal sodium levels. Males made up 81% of patients who presented with hyponatremia on admission and 77% of patients who developed hyponatremia within 72 hours.

Patients who presented with or developed hyponatremia more often were smokers(81%) and had diabetes(44%), anterior infarction(72 and 83%), lower ejection fraction(40.36 ±6.14) compared to patients with normal sodium levels.

Table 2 : Showing Hyponatremia On Admission And At 72 Hours And Outcome In Terms Of Mortality:

	Normal sodium levels	Hyponatremia on admission	Hyponatremia within 72 hours	Total
No. of patients	71	11	18	100
Mortality in each group at the end of 30 days	2	3	3	008

Table 3 : Showing Severity Of Hyponatremia And Outcome In Terms Of Mortality

Range of Sodium levels in hyponatremia patients	No. of patients	Mortality
<130	3	3(100%)
131-134	26	3(11.11%)

Table 4: Odds Ratio For 30 Day Mortality Group 1 Versus Other Groups

	Survivors	Non survivors	Odds ratio	P value
Group1	69	2		
Group2	8	3	5.03	0.01
Group3	15	3	6.9	0.02

Group1= patients with normal sodium levels
Group2= hyponatremia on admission.
Group3= hyponatremia within 72 hours.

Odds ratio for 30 day mortality was found to be high in hyponatremic groups.(Group2=5.03, Group3=6.9)

DISCUSSION

Our study suggests that patients presenting with acute myocardial infarction who had hyponatremia on admission or developed hyponatremia after admission represent high risk population .

In our study substantial proportion of patients who presented with acute ST elevation myocardial infarction were hyponatremic on admission or developed hyponatremia shortly after admission.

Previous studies have focused on the prognostic implications of hyponatremia in patients with chronic heart failure. In the presence of heart failure, several mechanisms promote the development of hyponatremia.

Vasopressin is essential to the development of hyponatremia because at least 15 liters of fluids can be excreted daily when vasopressin is appropriately inhibited[5]. Hypoosmolarity, which inhibits the release of vasopressin in healthy subjects, is associated with persistently high plasma concentrations of vasopressin in heart failure [6]. Activation of carotid baroreceptors has been implicated in the nonosmotic release of vasopressin due to arterial underfilling [7,8,9].

Moreover, the renal effect of vasopressin is enhanced in heart failure, as the vasopressin-regulated water channel (AP2) in the collecting duct is upregulated [10].

In acute myocardial infarction, non osmotic release of vasopressin may occur due to the acute development of left ventricular dysfunction; in response to pain, nausea, and major stress, the most common mechanisms of hyponatremia in adults; or in response to the administration of analgesics and diuretics [11, 12].In this setting, vasopressin levels increase concomitantly with the activation of other neurohormones such as renin and norepinephrine [13].

However, vasopressin level does not correlate with serum osmolarity in myocardial infarction suggesting that nonosmotic mechanisms are involved. In patients with myocardial infarction,[14] hyponatremia may be aggravated further by the concomitant activation of the renin-angiotensin system and increased catecholamine production [14,15,16].

These factors decrease the glomerular filtration rate and subsequent delivery of tubular fluid to the diluting segment of the nephron, further contributing to decreased renal water excretion [17].

When we compared the various risk factors and outcomes among the survivors and the non survivors, we found, apart from age, sex, diabetes, hypertension, ejection fraction, hyponatremia was significant risk factor in determining mortality.

All the variables among the survivors and non survivors that were significantly associated with mortality were included in the multivariate logistic regression analysis. Hyponatremia remained a significant independent predictor of mortality. This is in concordance to similar study conducted by Goldberg et al.,[18]. They found that hyponatremia was independently associated with 30 day mortality.

Patients who presented or developed hyponatremia more often had diabetes, anterior infarction and lower ejection fraction. This is in accordance to the study conducted by Goldberg[18] et al.

CONCLUSION

In our study we concluded that hyponatremia on admission or early development of hyponatremia in patients with acute ST elevation myocardial infarction is an independent predictor of 30-day mortality. Plasma sodium levels may serve as a simple marker to identify patients at risk.

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Conflicts Of Interest:
There are no conflicts of interest

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