Journal of Cardiovascular Disease Research

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 12, 2023

HYPONATRAEMIA AS AN INDEPENDENT PREDICTOR OF SHORT TERMMORTALITY IN HOSPITALISED PATIENTS OF ACUTE ST ELEVATED MYOCARDIAL INFARCTION

Dr. Palli Kanchanamala, Dr. Obulapuram Suneetha, Dr. A. Arjun, Dr. B. Pavan Kumar

Post Graduate, Department of General Medicine

Associate Professor, Department of General Medicine3rd Author: Assistant Professor,

Department of General Medicine

Assistant Professor, Department of General Medicine

Introduction: Clinically, myocardial infarction is well-known and is one among the many leading causes of death and disability worldwide, affecting people of all racial and ethnic backgrounds. Any person can be affected by it, and it can have serious negative psychological, financial, and economic ramifications. Acute coronary syndrome is a significant public health issue in both industrialised and emerging nations, and despite studies on diagnosis and treatment over the past four decades, its importance is growing there. Studies today show that there is a decrease in infectious disease, while ischemic heart disease and acute myocardial infarction are rapidly increasing in developing nations due to rising economic development and lifestyle changes that encourage atherosclerosis. Although there exists a significant discrepancy in the resources available to treat acute myocardial infarction in developing nations like India, significant efforts are still required to establish primary preventive activities at the community level. One of the most prevalent electrolyte disorders is hyponatremia. Hyponatremia is the major risk factor for cardiovascular death in heart failure patients. Congestive heart failure, chronic glomerular nephritis, and cirrhosis of liver patients are the most prevalent inpatients with this condition, which is typically diagnosed in the first postoperative week following surgery. Since acute myocardial infarction and heart failure both cause neurohumoral activation, hyponatremia is frequently discovered following myocardial infarction. The rise in serum sodium concentration causes the clinical symptoms of hyponatremia to improve. Although the prognostic significance of hyponatremia in chronic heart failure is well established, it is discovered that there is insufficiency of data in the case of acute myocardial infarction. The purpose of my study is to investigate the prognostic significance of hyponatremia in acute ST-elevated myocardial infarction and to assess how beneficial it is in predicting short-term survival

Aim: To study Hyponatremia as an independent predictor of short term mortality among hospitalized patients of Acute STEMI.

Objectives:

1. To find out the incidence of Acute STEMI in Medical ICU patients.
2. To find out the incidence of Hyponatremia among patients of Acute STEMI.
3. To study the relationship between hyponatremia and mortality in Acute STEMI patients.

Study Design: Prospective observational cohort study.

Study Setting: All patients were prospectively enrolled from the MICU of General Medicine Department at Government General Hospital, Kadapa.

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 12, 2023

Study Subjects: Patients >18 years of age with STEMI admitted in our MICU on the basis of history, clinical examination, ECG changes, Cardiac Enzymes

Sample Size: 100

Study Period: JULY 2022 to JULY 2023.

Inclusion Criteria:
Patients having acute STEMI defined by ST segment elevation of >2 mm in precordial leads, (or) >1 mm in frontal leads in 2 or more consecutive leads with or without Q waves in standard electrocardiogram (ECG) with any one of the following:
(a) Typical chest pain suggestive of angina lasting for more than 20 minutes, (or) anginal equivalents like breathlessness, chest discomfort or sweating.
(b)Raised cardiac enzymes (CPK-MB, Troponin I or T).

Exclusion Criteria:

- Patients with co-morbid conditions like previously detected CCF, LV dysfunction, renal disease, decompensated liver disease, fresh cerebrovascular accidents, malignancies, acute gastroenteritis.
- Patients on any medications that alter serum sodium level like diuretics, steroids, antacid, ACE inhibitors, amiodarone, clofibrateetc.
- Patients with very late presentation of acute STEMI.
- Patient with acute onset LBBB.

PROCEDURE:

In the patients who fulfilled the inclusion criteria, detailed history and clinical examination was done. They are subjected to biochemical investigations:

1. ECG and Chest Xray.
2. Complete blood count.
3. Blood sugar by glucose oxidase method.
4. Blood urea.
5. Serum creatinine.
6. Serum sodium by ion specific electrode method
7. Cardiac Enzymes (Troponin I)
8. Lipid profile.

Venous samples were taken to check for sodium levels at the time of admission and at 24, 48 and 72 hours. At the same time blood glucose levels were checked and sodium levels are corrected by adding 1.6mEq/L for every 100mg/dl increase in blood glucose levels. Hyponatremia is defined as serum sodium level below 135 mEq/L.

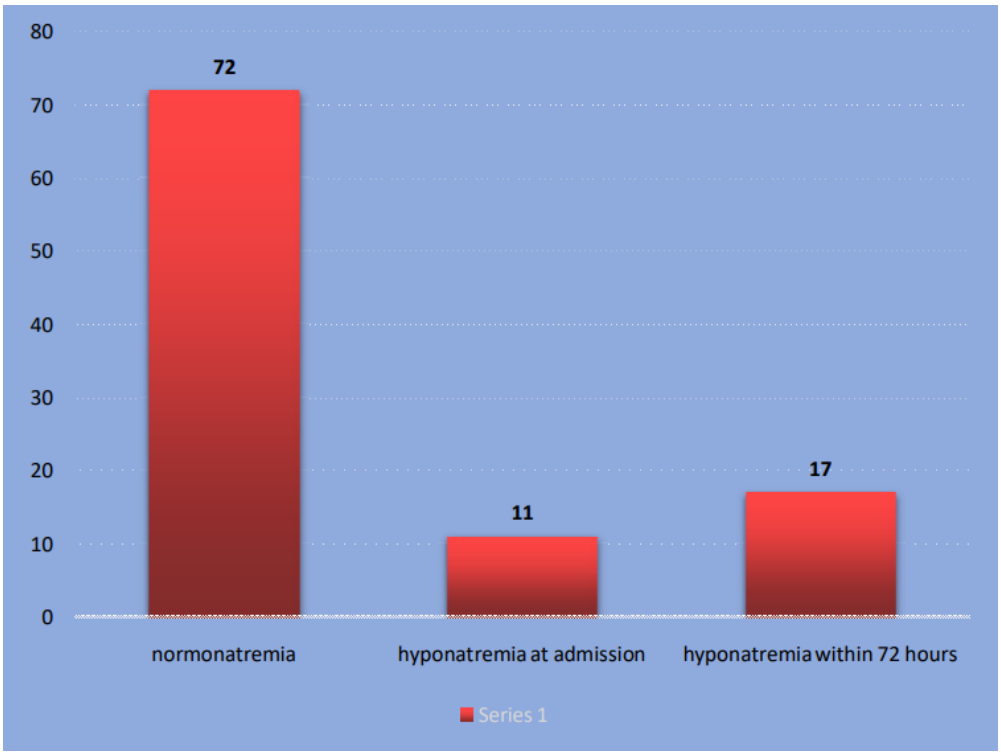
Ethical Clearance: Before collection of data, all subjects were briefed about the purpose of the study and written informed consent was obtained. All investigations were done free of cost and no financial burden imposed on the patient. Ethical clearance was obtained from the institutional ethics committee.

Statistical analysis: Statistical analysis was carried out for 75 subjects (50 alive, 25 died). Age, sex, BMI, diabetes, hyper tension, dyslipidemia, obesity, smoking left ventricle end-diastolic diameter, NYHA class, Ejection fraction, TSH, Total T3, Free T3, Total T4 and Free T4 were analyzed. Results were expressed as Mean and Standard Deviation (SD). The difference in means between the two groups

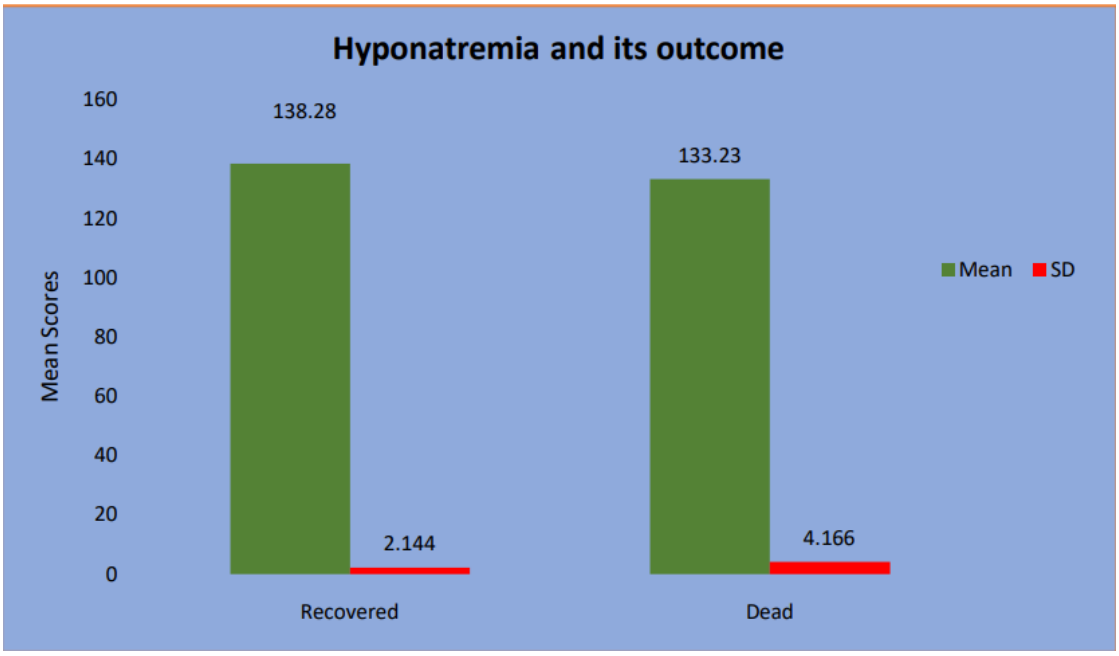
ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 12, 2023

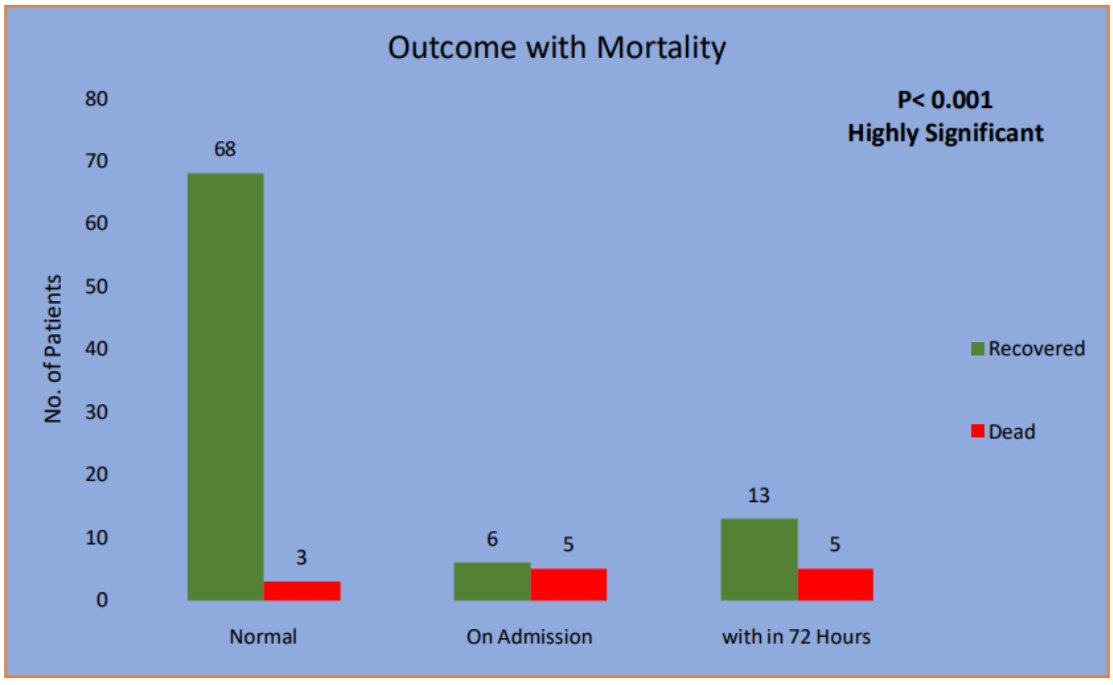
was calculated using the Student t-test and the significance of the difference in proportions using the chi-square statistic. Statistical significance was taken when $p<0.05$. All variables with significant associations were entered in Cox Proportional Hazard Model for multivariate analysis with 95% confidence intervals. Pearson's correlation was used to analyze the correlation between variables found significant in multivariate analysis. All statistical analysis were performed using SPSS (Statistical package for social sciences) software for windows.

RESULT:



ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 12, 2023





ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 12, 2023

Discussion: Cardiovascular disease is the most common cause of mortality worldwide in recent years. It is estimated that 15 million deaths are due to CVD [1]. The incidence of coronary artery disease is increasing day by day in developing countries like india and even younger age groups are affected due to changes in the life style. The risk factors for CVD are metabolic syndrome, dyslipidemia, diabetes, hypertension and new risk factors like homocystinemia, infections, inflammations etc [2]. India is the second largest population country and around 30% of the mortality is found to be due to CVD. Death due to CVD is more than that of stroke mainly due to sedentary life style and changing diet habits.

According to a study by Szatalowicz VL, Schrier RW, Arnold PE, Chaimotivz C, Bichet D, and Berl T, 40–45 patients with congestive heart failure had detectable arginine vasopressin levels, and vasopressin is crucial for the occurence of hyponatremia. The degree of neurohumoral activation is closely correlated with the severity of hyponatremia in individuals with congestive heart failure [3].

In a separate study by Hartford M et al., involving about 550 patients, neurohumoral activation was found to be a reliable indicator of poor prognosis in post-infracture patients at the time of hospital release [4] .

According to a study by Sigurdsson A, Held P, and Swedberg K, which involved 56 patients with acute myocardial infarction [5], there is continual neurohumoral activation after myocardial infarction, primarily in patients with clinical heart failure, and even in patients without clinical heart failure, it is related to the severity of myocardial damage. Hyponatremia, a very easymarker of neurohumoral activation, occurs during the acute phase of myocardial infarction and can be used to predict the long-term progression of heart failure and death, according to research by Goldberg A. on around 970 patients [6] .

This study was conducted among 100 acute MI patients who were admitted in medical ICU in government general hospital, kadapa. Out of the 100 AMI patients, 74 were male patients and 26 were female patients. This shows that myocardial infarction is seen more commonly in males in this study.

This finding is similar to that of the study done by Breen T et al.[7], in which they found that myocardial infarction was common in males (62.5%). Similar finding was observed in the study conducted by Yoshioka N, Takagi K et al. [8], among 1222 patients of STEMI who underwent primary PCI.

They found that STEMI was more common in males (75.5%). Plakht Y, Gilutz H, Shiyovich A [9] studied sodium levels in acute myocardial infarction patients as a marker of in hospital mortality and found that acute myocardial infarction is more common in males (66.6%) than in females.

Lazzeri C, Valente S et al., [10] studied the Usefulness of hyponatremia as a marker of severity among 1231 ST-elevation myocardial infarction patients in whom primary percutaneous coronary intervention was done and concluded that hyponatremia is more common among old patients and added that presence of hyponatremia should be taken as marker of severity in STEMI patients. Hyponatremia was present in 18.5% of AMI patients at the time of admission and 0.8% of patients throughout the first 72 hours, according to Satish et al. Up to 7 days after admission, 50.2% of patients exhibited hyponatremia, according to Cordova Sanchez A et al

Cordova Sanchez A et al.[11], studied the association of hyponatremia and clinical outcomes in patients with acute myocardial infarction and found that hyponatremia at admission had an in- hospital mortality rate of 16.3% and a 30 day mortality of 18.4

In accordance with our study, which found hyponatremia to be a significant risk factor determining mortality, Goldberg's study found that hyponatremia was an independent risk factor for 30-day mortality.

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 12, 2023

When we compared the outcomes between survivors and non-survivors, we discovered that hyponatremia

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 12, 2023

was important among them along with sex, age, hypertension, diabetes, killip class of admission. All the variables linked to mortality in survivors and non-survivors were taken into account in the multivariate logistic regression analysis. Hyponatremia served as the independent predictor in this analysis that was significant for death

Conclusion: The mean age of myocardial infarction is 57.22 ± 12.066 years. Majority of the subjects were male (74%). Hyponatremia was more common in males (p=0.007). Anterior wall MI (AWMI) was more commonly seen. Incidence of hyponatremia is 11% at admission and 18% within 72 hours of admission. Hyponatremia at admission and within 72 hours have found to show increased mortality risk. Odds ratio for 30 days mortality is significantly high in hyponatremic patients when compared with normonatremic patients. Severity of hyponatremia increases the risk of mortality. In univariate analysis, hyponatremia was significant risk factors of mortality in survivors and non survivors. Higher killip class on admission is associated with increased risk of mortality (p=0.001). The younger the age the better is the survival. There is no gender difference in the mortality rates. Other risk factors like diabetes, hypertension, smoking were not associated with increased mortality. Since hyponatremia is an independent predictor of mortality, myocardial infarction patients who are at risk can be identified by plasma sodium levels.

References:

1. Pahlajani DB. Myocardial infarction. In: Shash SN, Anand MP, Acharya VN, Bichile SK, Karnad DR, Kamath SA, etal editors. API Text Book of Medicine. 7th edition. Mumbai: API; 2003.p.441
2. Andersson C, Vasan RS. Epidemiology of cardiovascular disease in young individuals. Nat Rev Cardiol. 2018 Apr;15(4):230-240. doi: 10.1038/nrcardio.2017.154. Epub 2017 Oct 12. PMID: 29022571.
3. Adrogue HJ, Madias NE. Hyponatremia. N Engl J Med 2000; 342:1581-1589
4. Hartford M, Herlitz H, Perers E, Karlsson T, Herlitz J, Persson A, Caidahl K. Plasma renin activity has a complex prognostic role in patients with acute coronary syndromes. Int J Cardiol. 2021 Apr 15;329:198-204.doi: 10.1016/j.ijcard.2020.12.062. Epub 2020 Dec 29. PMID: 33385419.
5. Sigurdsson A, Held P, Swedberg K. Short- and long-term neurohormonal activation following acute myocardial infarction. Am Heart J. 1993 Nov;126(5):1068-76. doi: 10.1016/0002-8703(93)90656-t. PMID: 8237747.
6. Goldberg A, Hammerman H, Petcherski S, Zdorovyak A, Yalonetsky S, Kapeliovich M, Agmon Y, Markiewicz W, Aronson D. Prognostic importance of hyponatremia in acute ST-elevation myocardial infarction. Am J Med. 2004 Aug 15;117(4):242-8. doi: 10.1016/j.amjmed.2004.03.022. PMID: 15308433.

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 12, 2023

7. Breen T, Brueske B, Sidhu MS, Murphree DH, Kashani KB, Barsness GW, Jentzer JC. Abnormal Serum Sodium is Associated w

8. ith Increased Mortality Among Unselected Cardiac Intensive Care Unit Patients. J Am Heart Assoc. 2020 Jan 21;9(2):e014140. doi: 10.1161/JAHA.119.014140. Epub 2020 Jan 9. PMID: 31914877; PMCID: PMC7033827.)

9. Yoshioka N, Takagi K, Tanaka A, Morita Y, Yoshida R, Kanzaki Y, Nagai H, Watanabe N, Yamauchi R, Komeyama S, Sugiyama H, Shimojo K, Imaoka T, Sakamoto G, Ohi T, Goto H, Ishii H, Morishima I, Murohara T. The Mid-term Mortality and Mode of Death in Survivors with ST-elevation Myocardial Infarction. Intern Med. 2021 Jun 1;60(11):1665-1674. doi: 10.2169/internalmedicine.6549-20. Epub 2020 Dec 29. PMID: 33390500; PMCID: PMC822211

10. Plakht Y, Gilutz H, Shiyovich A. Sodium levels during hospitalization with acute myocardial infarction are markers of in-hospital mortality: Soroka acute myocardial infarction II (SAMI-II) project. Clin Res Cardiol. 2018 Oct;107(10):956-964. doi: 10.1007/s00392-018-1268-5. Epub 2018 May 15. PMID: 29766284

11. Lazzeri C, Valente S, Chiostri M, Attanà P, Picariello C, Gensini GF. Usefulness of hyponatremia in the acute phase of ST-elevation myocardial infarction as a marker of severity. Am J Cardiol. 2012 Nov 15;110(10):1419-24. doi: 10.1016/j.amjcard.2012.07.004. Epub 2012 Aug 3. PMID: 22863175

12. Cordova Sanchez A, Bhuta K, Shmorgon G, Angeloni N, Murphy R, Chaudhuri D. The association of hyponatremia and clinical outcomes in patients with acute myocardial infarction: a cross-sectional study. BMC Cardiovasc Disord. 2022 Jun 18;22(1):276.