Serum Electrolytes In Cardiomyopathy Patients And Its Association With Morbidity And Advance NYHA Classification

Abdul Qadir Bhutto[1],Nandlal Rathi[2], Jagdesh Kumar[3], Abdul Aziz Sahito[4], Kartik Kumar Rathi[5]

ABSTRACT

OBJECTIVE: The aim behind this study was to scientifically assess the serum electrolytes in cardiomyopathy patients and its association with morbidity and advance NYHA classification.

PATIENTS AND METHODS: A prospective cross-sectional study has been conducted in the department of cardiology Isra University Hospital Hyderabad through a convenience sampling technique. All the patients who were diagnosed cases of Cardiomyopathy (any type) and having age more than 16 years of both gender presented in advance NYHA (III – IV) classification were included in our study. Data were entered and analyzed by using Statistical Package for the Social Sciences version 19.0.**RESULTS:** The mean age of patients was 38.18 years (16.34 ± SD) and the study subjects consisted majority of males (59.01%). Out of 122 patients majority of the patients were presented between the age group of 41 – 55 years (N = 60, 49.18%). Most of the admitted patients presented in NYHA classification IV as compared to NYHA III, 59.83% (N = 73) and 40.16% (N = 49), respectively. Overall frequency of electrolytes deficiency in hospitalized patients was 47 (38.52%).**CONCLUSION:** Patients presented in NYHA classification III were more likely to have Hyponatremia and Hypobicarbonatemia while patients presented in NYHA classification IV were significantly has Hypernatremia, Hyperkalemia, and Hyperbicarbonatemia.

KEY WORDS: Heart Failure, Advance NYHA Classification, Electrolytes disturbance

1. PG Student, Department of Cardiology, Isra University Hospital, Hyderabad
2. Assistant Professor, Department of Cardiology, National Institute of Cardiovascular Disease, Tando Muhammad Khan
3. Assistant Professor, Department of Cardiology, PUMHSW,SBA
4. Associate Professor of Medicine, PUMHSW,SBA
5. A-Levels, Nixor College, Karachi

Correspondence : Assistant Professor, Department of Cardiology, National Institute of Cardiovascular Disease, Tando Muhammad Khan

drnand69@gmail.com

INTRODUCTION:

Heart failure is the leading cause of deaths worldwide and the prevalence is continued to rise including in Pakistan. Multiple risk factors contribute for the development of heart failure among them ischemic origin is the most common cause. Heart failure occurs when the heart unable to pump adequate amount of blood into body and causes signs and symptoms of inadequate tissue perfusion such as shortness of breath, peripheral edema, fatigue, cough, and lethargy[1,2].

Patients with heart failure are prone to electrolytes imbalance due to prolong use of drugs such as angiotensin-converting enzyme inhibitor/blocker and potassium sparing diuretics. Change in electrolytes may affect the electrical activity of myocardium and prone these patients to arrhythmias[3].

New York Heart Association (NYHA) classification is used to classify such patients the extent of heart failure based on their clinical presentation and signs &symptoms. Advanced NYHA

classification (III – IV) is associated with marked limitations of physical activity and hence these patients are in clinical deteriorated state causing high rates of morbidity and mortality, that is why these patients are of great concern [4].Worldwide and also in Pakistan, study on such patients has not been carried out through which one can assess the role of electrolytes in patients with advanced NYHA (III – IV) classification[5,6]. Because of lacking of data we aimed to conduct this study to determine the association of electrolytes in diagnosed patients of Cardiomyopathy and presented with advance NYHA classification (III – IV).

PATIENTS AND METHODS:

A prospective cross-sectional study has been conducted in the department of cardiology Isra University Hospital Hyderabad through a convenience sampling technique. All the patients who were diagnosed cases of Cardiomyopathy (any type) and having age more than 16 years of both gender presented in advance NYHA (III – IV) classification were included in our study. Before commencement of this study, consent was taken from ethical committee and also from patients or their attendant (if the patient condition was unsatisfactory).

A doctor was assigned for data collection and a structured questionnaire was made for collection of baseline and clinical variables. All the admitted patients were thoroughly examined at the time of presentation. A blood sample was taken in a disposable syringe for electrolytes assessment and other routine blood tests. Patients were labeled Cardiomyopathy if they had available reports of echocardiogram and is on guideline directed medical therapy (GDMD) for heart failure for at least 3 months.

Analyses of data were performed using software Statistical Package for the Social Sciences (SPSS) Version 19.0. Qualitative variables such as gender, area of residence, ethnicity, NYHA classification, and electrolytes imbalance were presented in the form of frequencies and percentages. Mean ± SD was calculated for quantitative variable like age.

RESULTS:

A total of 122 patients were selected for this study after fulfilling the already made inclusion and exclusion criteria. Majority of the study population consisted of male gender as compared to females 59.01% (N = 72) and 40.98% (N = 50), respectively. Minimum age of the study participants was 25 years and maximum was 75 years. The mean age of patients was 38.18 years (16.34 ± SD). Our main objective was to assess the serum electrolytes level in cardiomyopathy patients and its association with morbidity and advance NYHA classification. Most of the admitted patients presented in NYHA classification IV as compared to NYHA III, 59.83% (N = 73) and 40.16% (N = 49), respectively. [Presented via Figure No: 1]. Overall frequency of electrolytes deficiency in hospitalized patients was 47 (38.52%) and increased electrolytes in heart failure patients was 37 (30.32%). [Presented via Figure No: 2 & 3]Patients with hyponatremia and Hypobicarbonatemia were significantly associated with increased morbidity and presented in NYHA classification III (p – 0.002). And patients with Hyperkalemia and Hyperbicarbonatemia were more significantly presented in NYHA class IV (p – <0.001) [Presented via Table No: 1 & 2].

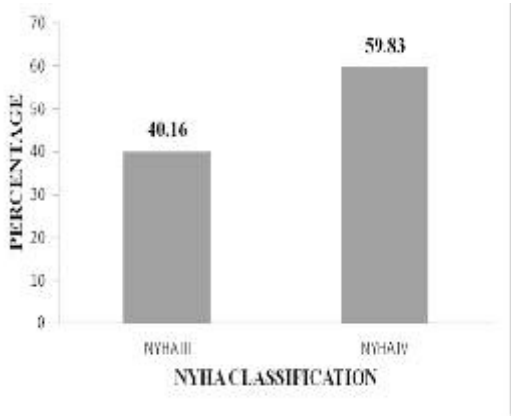


Figure 1: Percentage Of Patients With Advance Nyha Classification During Hospitalization (N= 122)

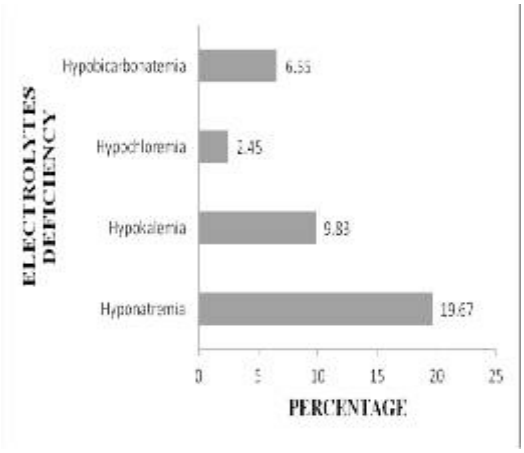
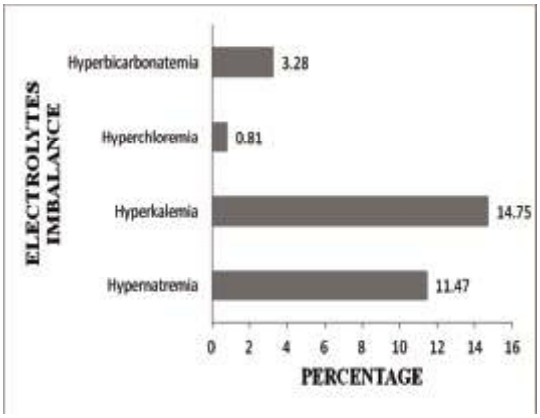


Figure 2: Percentageof Patients having Electrolytes Deficiency during Hospitalization (N=47)



Graph 3: Percentage Of Pateints Having Increased Electrolytes During Hospitalization (N= 37)

Table 1: relationship of electrolytes deficiency with nyha classification(n= 47)

ELECTROLYTES DEFICIENCY	NYHA CLASSIFICATION		P - Value
	NYHA III	NYHA IV	
Hyponatremia	14	10	**0.002***
Hypokalemia	6	6	
Hypochloremia	0	3	
Hypobicarbonatemia	2	6	

***Fisher's exact test was used to test the comparison between variables**

Table 2: Relationship Of Increased Electrolytes With Nyha Classification (N= 37)

ELECTROLYTES	NYHA CLASSIFICATION		P - VALUE
	NYHA III	NYHA IV	
Hypernatremia	2	12	**<0.001***
Hyperkalemia	5	13	
Hyperchloremia	0	1	
Hyperbicarbonatemia	1	3	

***Fisher's exact test was used to test the comparison between variables**

DISCUSSION:

Heart failure is a common clinical syndrome observed in patients with cardiomyopathy. Patients with heart failure with reduced ejection fraction (EF <40%) usually takes diuretics and ACEs / ARBs for lifelong as compared to patients with heart failure with preserved (EF >50%) or mid-ranged ejection fraction (EF >40% - <50%)[7,9].

Electrolytes imbalance in such patients are quite common with multiple reasons including drugs and chronic illness. Among all reasons, advance NYHA class is one of the most common causes of hospitalization and associated mortality. In a previously conducted study, hyponatremia was their most common electrolytes imbalance accounting for 15 – 30%. On the other hands, almost similar rate of hyponatremia observed in our study (19.67%). A larger scaled clinical trial was conducted on more than 47,000 heart failure patients and observed that more than 25% had low serum sodium level at the time of admission which was associated with increased duration of hospital stay and also higher mortality rates when compared it with normal and high serum sodium levels [10,13].

Altered in serum potassium levels whether low or high has potential effect in the development of cardiac arrhythmias particularly ventricular origin. Studies have observed comparatively low prevalence (<10%) of hyperkalemia than hyper or hyponatremia but high prevalence than hypokalemia. The chances of having hyperkalemia in patients with heart failure with advance NYHA class is 2 to 4 folds in patients using potassium sparing diuretics and higher number of type 2 diabetes mellitus along with chronic kidney disease. While comparing it with our study, the burden of hyperkalemia is much higher in our study (14.75%). This could be because of increase number of patients using potassium sparing diuretics and ACEi drugs and on another possible reason is a geographical and basic demographic difference of hospitalized patients [14,15]

Our study has shown the significant association with NYHA class. Hyponatremia and Hypokalemia were significantly observed in patients presented with advance NYHA class (III – IV). Similar findings were observed in a previously published Pakistani studies [16,17] although the burden of hypokalemia is quite low but its association with the disease imposes a significant relation [18,19]

CONCLUSION:

In our study, we have scientifically filled the gap of association between electrolytes and heart failure associated hospitalization. Electrolytes imbalance is the major reason of hospitalization in cardiomyopathy patients particularly when they present in NYHA classification III – IV. Patients presented in NYHA classification III were more likely to have Hyponatremia and Hypobicarbonatemia while patients presented in NYHA classification IV were significantly has Hypernatremia, Hyperkalemia, and Hyperbicarbonatemia.

REFERENCE

(1) DeVore AD, McNulty S, Alenezi F, Ersboll M, Vader JM, Oh JK, et al. Impaired left ventricular global longitudinal strain in patients with heart failure with preserved ejection fraction: insights from the RELAX trial. Eur J Heart Fail 2017 Feb 14.

(2) Itoh H, Kurihara I, Miyashita K, Tanaka M. Clinical significance of 'cardiometabolic memory': a systematic review of randomized controlled trials. Hypertens Res 2017 Jan 19.

(3) Maron BJ, Towbin JA, Thiene G, Antzelevitch C, Corrado D, Arnett D, et al. Contemporary definitions and classification of the cardiomyopathies: an American Heart Association Scientific Statement from the Council on Clinical Cardiology, Heart Failure and Transplantation Committee; Quality of Care and Outcomes Research and Functional Genomics and Translational Biology Interdisciplinary Working Groups; and Council on Epidemiology and Prevention. Circulation 2006 Apr 11;113(14):1807-16.

(4) Nassif ME, Novak E, Rich MW. Association of serum bicarbonate with long-term outcomes in patients hospitalized with heart failure. Int J Cardiol 2014 Dec 15;177(2):673-5.

(5) Pavlovic D. The role of cardiotonic steroids in the pathogenesis of cardiomyopathy in chronic kidney disease. Nephron Clin Pract 2014;128(1-2):11-21.

(6) Romanovsky A, Bagshaw S, Rosner MH. Hyponatremia and congestive heart failure: a marker of increased mortality and a target for therapy. Int J Nephrol 2011;2011:732746.

(7) El SA, Newman DB, Miranda WR, Nishimura RA. Hypertrophic Obstructive Cardiomyopathy and Uncontrolled Hypertension: A Therapeutic Challenge. JACC Cardiovasc Interv 2016 Jan 11;9(1):e3-e4.

(8) Rudic B, Tulumen E, Liebe V, Kuschyk J, Akin I, Borggrefe M. [Sudden cardiac death : Epidemiology, pathophysiology and risk stratification]. Herz 2017 Feb 22.

(9) Behnes M, Mashayekhi K, Borggrefe M, Akin I. [Coronary artery disease : Interventional and operative therapeutic options after cardiac arrest]. Herz 2017 Feb 22.

(10) Cowie MR, Lopatin YM, Saldarriaga C, Fonseca C, Sim D, Magana JA, et al. The Optimize Heart Failure Care Program: Initial lessons from global implementation. Int J Cardiol 2017 Feb 12.

(11) Patel K, Fonarow GC, Kitzman DW, Aban IB, Love TE, Allman RM, et al. Aldosterone antagonists and outcomes in real-world older patients with heart failure and preserved ejection fraction. JACC Heart Fail 2013 Feb;1(1):40-7.

(12) Mentz RJ, Wojdyla D, Fiuzat M, Chiswell K, Fonarow GC, O'Connor CM. Association of beta-blocker use and selectivity with outcomes in patients with heart failure and chronic obstructive pulmonary disease (from OPTIMIZE-HF). Am J Cardiol 2013 Feb 15;111(4):582-7.

(13) Mentz RJ, Fiuzat M, Wojdyla DM, Chiswell K, Gheorghiade M, Fonarow GC, et al. Clinical characteristics and outcomes of hospitalized heart failure patients with systolic dysfunction and chronic obstructive pulmonary disease: findings from OPTIMIZE-HF. Eur J Heart Fail 2012 Apr;14(4):395-403.

(14) Motta D, Cesano G, Pignataro A, Boero R. [Severe hyperkalemia in patients referred to an emergency departement: the role of antialdosterone drugs and of renin-angiotensin system blockers]. G Ital Nefrol 2017 Jan;34(1).
(15) Glogowski T, Wojtaszek E. [Hyperkalemia - current therapuetic strategies]. Wiad Lek 2016;69(5):745-8.
(16) Imbriano LJ, Mattana J, Drakakis J, Maesaka JK. Identifying Different Causes of Hyponatremia With Fractional Excretion of Uric Acid. Am J Med Sci 2016 Oct;352(4):385-90.
(17) Rao GM. Hyponatremia in acute decompensated heart failure : Impact on prognosis. J Assoc Physicians India 2016 Jan;64(1):83.
(18) Hoss S, Elizur Y, Luria D, Keren A, Lotan C, Gotsman I. Serum Potassium Levels and Outcome in Patients With Chronic Heart Failure. Am J Cardiol 2016 Dec 15;118(12):1868-74.
(19) Krogager ML, Eggers-Kaas L, Aasbjerg K, Mortensen RN, Kober L, Gislason G, et al. Short-term mortality risk of serum potassium levels in acute heart failure following myocardial infarction. Eur Heart J Cardiovasc Pharmacother 2015 Oct;1(4):245-51.