

# Determine the Incidence of Renal Dysfunction and Electrolyte Imbalance in Chronic Heart Failure Patients

Renal and Electrolyte Dysfunction in CHF Patients

Ali Saqlain Haider<sup>1</sup>, Abad ur Rehman Awan<sup>1</sup>, Ali Sajjad<sup>2</sup>, Ayesha Tariq<sup>2</sup> and Mateen Akram<sup>1</sup>

## ABSTRACT

**Objective:** To examine the prevalence of renal dysfunction and electrolyte disorders in patients presented with chronic heart failure.

**Study Design:** Observational / Cross sectional study.

**Place & Duration of Study:** This study was conducted at the Department of Nephrology, Shaikh Zayed Hospital Lahore from October 2018 to March 2019.

**Methods:** Total 210 patients of both genders with ages 25 to 75 years presented with chronic heart failure were analyzed. Patients detailed demographic were recorded after taking written consent. Blood samples of all the patients were collected to examine the serum electrolyte and serum creatinine. Prevalence of renal dysfunction and electrolyte disorders were recorded.

**Results:** One hundred and fifty two (72.38%) patients were males while 58 (27.62%) patients were females. 85 (40.48%) patients were ages 25 to 50 years and 125 (59.52%) were ages between 51 to 75 years. Renal dysfunction was found in 61 (29.05%) patients, 56 (26.67%) patients had hypokalemia and hyponatremia was found in 59 (28.10%) patients.

**Conclusion:** The incidence of renal dysfunction and electrolyte disorders in patients with chronic heart failure was high. Patients with ages above 50 years had high rate of renal dysfunction, hypokalemia and hyponatremia.

**Keywords:** Chronic heart failure, Renal dysfunction, Hyponatremia, Hypokalemia.

**Citation of article:** Haider AS, Awan AR, Sajjad A, Tariq A, Akram M. Determine the Incidence of Renal Dysfunction and Electrolyte Imbalance in Chronic Heart Failure Patients. *Med Forum* 2019;30(12):65-68.

## INTRODUCTION

Heart failure (HF) is a complex syndrome, resulting from structural or functional cardiac disorders that impair the ability of the cardiac pump to support a physiological circulation.<sup>1</sup> Congestive heart failure affects about 2% of the western population, with prevalence increasing sharply from 1% in 40 years old to 10% above age 75 and it is the most common cause of hospitalization in patients over 65 years of age.<sup>2</sup>

Electrolyte abnormalities and renal dysfunction are common among patients with chronic heart failure (CHF) and may be caused by the disease itself or its treatment.<sup>3</sup>

<sup>1</sup>. Department of Nephrology, National Institute of Kidney Diseases, Shaikh Zayed Medical Complex Lahore.

<sup>2</sup>. Department of Cardiology, Faisalabad Institute of Cardiology, Faisalabad.

Correspondence: Dr. Ali Saqlain Haider, Senior Registrar of Nephrology, National Institute of Kidney Diseases, Shaikh Zayed Medical Complex Lahore.  
Contact No: 03009411567  
Email: saqlain.dr@gmail.com

Received: June, 2019

Accepted: September, 2019

Printed: December, 2019

All patients with evidence of volume overload or a history of fluid retention should be treated with diuretics.<sup>4</sup> The minimum required dose should be used because over-diuresis exacerbates the activation of the Renin Angiotensin System and may result in prerenal azotemia and electrolyte abnormalities.<sup>5,6</sup>

Hypokalemia makes ventricular myocardium more susceptible to potentially lethal arrhythmias. It has been shown that 22% patients with congestive heart failure develop hypokalemia.<sup>7</sup> Hyponatremia and renal dysfunction in patients with CHF signifies poor prognosis.<sup>8,9</sup> Hyponatremia in CHF is associated with significantly higher rates of in-hospital and follow-up mortality and longer hospital stays.<sup>10</sup> It has been shown that 24% patients with CHF develop hyponatremia. Even mild to moderate elevations in baseline blood urea nitrogen predicts increased post discharge mortality in patients hospitalized for heart failure. In a meta-analysis 29% CHF patients were found to have moderate to severe renal impairment.<sup>11</sup>

The present study was conducted / aimed to examine the incidence of renal dysfunction and electrolyte disorders such as hyponatremia and hypokalemia in patients presented with chronic heart failure.

## MATERIALS AND METHODS

This cross sectional/observational study was conducted at Department of Nephrology, Shaikh Zayed Hospital

Lahore from 1<sup>st</sup> October 2018 to 31<sup>st</sup> March 2019. Two hundred and ten patients of both genders with ages 25 to 75 years presented with chronic heart failure were analyzed. Patient's demographics including age, sex and residence were recorded after taking written informed consent. Patients with chronic liver disease, patients with chronic kidney disease and diabetic nephropathy patients were excluded. Blood samples of all the patients were collected to examine the serum creatinine and serum electrolyte. Serum creatinine >1.5mg/dl define as renal dysfunction, patients with serum potassium level <3.5mg/dl defined to had hypokalemia and serum sodium level <135mg/dl defined hyponatremia. Prevalence of renal dysfunction and electrolyte disorders were recorded. All the data was analyzed by SPSS 24.0. Frequency and percentages were recorded in tabulation form. P-value <0.05 was set as statistically significant.

## RESULTS

There were 152 (72.38%) male patients while 58 (27.62%) patients were females. Eighty five (40.48%) patients were ages 25 to 50 years and 125 (59.52%) were ages between 51 to 75 years. One hundred and thirty (61.90%) patients had urban residency while 80 (39.10%) patients had rural residence (Table 1). Renal dysfunction was found in 61 (29.05%) patients, 56 (26.67%) patients had hypokalemia and hyponatremia was found in 59 (28.10%) patients (Table 2).

**Table No.1: Demographic information of the patients**

Variable	No.	%
<b>Gender</b>		
Male	152	72.38
Female	58	27.62
<b>Age (years)</b>		
25 – 50	85	40.48
50 – 75	125	59.52
<b>Residence</b>		
Urban	130	61.9
Rural	80	39.1

**Table No.2: Frequency of renal dysfunction, hypokalemia and hyponatremia in CHF patients**

Variables	No.	%
<b>Renal Dysfunction</b>		
Yes	61	29.05
No	149	71.95
<b>Hyponatremia</b>		
Yes	59	28.1
No	151	71.9
<b>Hypokalemia</b>		
Yes	56	26.67
No	154	73.33

According to the age-wise distribution, out of 61 renal dysfunction patients 40 (65.58%) patients were ages above 50 years and 21 (34.42%) patients were ages below 50 years. From 59 hyponatremia patients 32 (54.24%) were ages above 50 years and 27 (45.76%) patients had ages below 50 years and out of 56 hypokalemia patients 34 (60.71%) patients were ages above 50 years while 22 (39.29%) patients had ages below 50 years (Table 3)

**Table No.3: Stratification of age according to renal dysfunction and electrolyte disorders**

Variable	Age (years)		P value
	25-25	51-75	
Renal Dysfunction (n=61)	21 (34.42%)	40 (65.58%)	0.025
Hyponatremia (n=59)	57 (45.76%)	32 (54.24%)	0.328
Hypokalemia (n=56)	22 (39.29%)	34 (60.71%)	0.029

## DISCUSSION

Chronic heart failure is one of the most common disorders in all over the world with high rate of mortality and morbidity.<sup>12</sup> Renal dysfunction and electrolyte disorders are most common disorders in patients with chronic heart failure. Many of studies have been conducted to examine the prevalence of renal dysfunction, hypokalemia and hyponatremia in patients with chronic heart failure and reported these disorders contributed high rate of morbidity and mortality and increase length of hospital stay in CHF patients.<sup>13,14</sup> Present study was conducted to examine the incidence of renal dysfunction and electrolyte disorders including (hypokalemia and hyponatremia) in patients presented with chronic heart failure. In this regard we included 210 patients. We found male patients were high in numbers 72.38% as compared to females 27.62%. Many of previous studies reported that male patients with chronic heart failure were high in numbers 60 to 80% as compared to females.<sup>15,16</sup> In our study majority of patients 59.52% were ages above 50 years. These results showed similarity to many other studies in which patients with elderly ages had high incidence rate of chronic heart failure.<sup>17</sup>

In present study, renal dysfunction was found in 61 (29.05%) patients, 56 (26.67%) patients had hypokalemia and hyponatremia was found in 59 (28.10%) patients. A study conducted by Haq et al<sup>18</sup> reported renal dysfunction in 26.9%, hypokalemia in 24.6% and hyponatremia in 28.4% patients presented with chronic heart failure. Another study conducted by Aziz et al<sup>6</sup> reported the incidence of renal dysfunction in chronic heart failure was 37.4%, hyponatremia in 32.1% patients and hypokalemia in 18.1% patients.

In the current study, according to the age-wise distribution, out of 61 renal dysfunction patients 40 (65.58%) patients were ages above 50 years and 21 (34.42%) patients were ages below 50 years. From 59 hyponatremia patients 32 (54.24%) were ages above 50 years and 27 (45.76%) patients had ages below 50 years and out of 56 hypokalemia patients 34 (60.71%) patients were ages above 50 years while 22 (39.29%) patients had ages below 50 years. These results showed similarity to many previous studies in which patients with elderly ages had high risk of renal dysfunction, hypokalemia and hyponatremia.<sup>19-21</sup>

## CONCLUSION

Renal dysfunction and electrolyte disorders are most common in patients with chronic heart failure and causes high rate of mortality and morbidity in CHF patients. We concluded from this study that the incidence of renal dysfunction and electrolyte disorders in patients with chronic heart failure was high. Patients with ages above 50 years had high rate of renal dysfunction, hypokalemia and hyponatremia.

### Author's Contribution:

Concept & Design of Study: Ali Saqlain Haider  
 Drafting: Abad ur Rehman Awan  
 Data Analysis: Ali Sajjad, Ayesha Tariq, Mateen Akram  
 Revisiting Critically: Ali Saqlain Haider, Abad ur Rehman Awan  
 Final Approval of version: Ali Saqlain Haider

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

## REFERENCES

- Blanche C, Fumeaux T, Polikar R. Heart failure with normal ejection fraction: is it worth considering? *Swiss Med Wkly* 2010;140(5-6): 66-72.
- Donal E, Lund LH, Linda C, Edner M, Lafitte S, Persson H, et al. Rationale and design of the Karolinska-Rennes( Ka Ren) prospective study of dyssynchrony in heart failure with preserved ejection fraction. *Eur J Heart Fail* 2009;11(2): 198-204.
- Hardaway B, Tang WHW. Heart failure with systolic dysfunction. In: Griffin BP, Topol EJ, editors. *Manual of cardiovascular medicine*. New Delhi: Lippincott; 2009.p.109.
- Mann DL. Management of heart failure patients with reduced ejection fraction. In: Bonow RO, Mann D, Zipes D, Libby P, editors. *Braunwald's heart disease: a textbook of cardiovascular medicine*. New Delhi: Elsevier; 2008.p.624.
- Rodeheffer RJ, Redfield MM. Pharmacologic therapy of systolic ventricular dysfunction and heart failure. In: Murphy JG, Lloyd MA, editors. *Mayo clinic cardiology concise textbook*. USA: Mayo Clinic Scientific Press; 2007.p.1121.
- Aziz AA, Abdul-Zahra MS, AL-Shamma YMH, Abdul-Ghafoor A. Hypomagnesemia versus hypokalemia in Patients with congestive heart failure: the effect of severity of the disease. *Kufa Med J* 2010;13(1):1-5.
- Abraham WT, Fonarow GC, Albert NM, Stough WG, Gheorghiade M, Greenberg BH, et al. Predictors of in hospital mortality in patients hospitalized for heart failure insights from the Organized Program to Initiate Life saving Treatment in Hospitalized Patients with Heart Failure (OPTIMIZE-HF). *J Am Coll Cardiol* 2008; 52():347-56.
- Mitchell P, Marle D, Donkor A, Shote A, McDonagh T, Hardman S, et al National Heart Failure Audit April 2013 - March 2014. National Institute for Cardiovascular Outcomes Research 2015.
- Michel A, Martin-Perez M, Ruigomez A, Garcia Rodriguez LA. Incidence and risk factors for severe renal impairment after first diagnosis of heart failure: a cohort and nested case-control study in UK general practice. *Int J Cardiol* 2016;207: 252-7.
- Pun PH, Lehrich RW, Honeycutt EF, Herzog CA, Middleton JP. Modifiable risk factors associated with sudden cardiac arrest within hemodialysis clinics. *Kidney Int* 2011;79(2):218-27.
- Mohammad AA, Kimmenade RR, Richards M, Bayes-Genis A, Pinto Y, Stephanie A, et al. Hyponatremia, natriuretic peptides and outcomes in acutely destabilized heart failure. *J Am Coll Cardiol* 2010; 55(10Suppl): A26.
- Khattak HK, Khalid S, Manzoor K, Stein PK. Recurrent life-threatening hyperkalemia without typical electrocardiographic changes. *J Electrocardiol* 2014; 47(1):95-7.
- Al-Naher A, Wright D, Devonald MAJ, Pirmohamed M. Renal function monitoring in heart failure- what is the optimal frequency? A narrative review. *Br J Clin Pharmacol* 2018; 84: 5-17.
- Damman K, Valente MA, Voors AA, O'Connor CM, van Veldhuisen DJ, Hillege HL. Renal impairment, worsening renal function, and outcome in patients with heart failure: an updated meta-analysis. *Eur Heart J* 2014; 35: 455-469.
- Damman K, Tang WH, Felker GM, Lassus J, Zannad F, Krum H, et al Current evidence on treatment of patients with chronic systolic heart failure and renal insufficiency: practical considerations from published data. *J Am Coll Cardiol* 2014; 63: 853-71.
- Baber U Howard VJ Halperin JL Soliman EZ Zhang X McClellan W et al. Association of chronic

- kidney disease with atrial fibrillation among adults in the United States: reasons for geographic and racial differences in stroke (REGARDS) study. *Circ Arrhythm Electrophysiol* 2011;4:26–32.
17. Beldhuis IE, Streng KW, Ter Maaten JM, Voors AA, van der Meer P, Rossignol P, et al. Renin-angiotensin system inhibition, worsening renal function, and outcome in heart failure patients with reduced and preserved ejection fraction: a meta-analysis of published study data. *Circ Heart Fail* 2017;10(2):1-12.
  18. Haq MR, Faheem M, Dar MH, Hadi A, Ikramullah. Frequency of hyponatremia, hypokalemia and renal dysfunction in patients with chronic heart failure. *Pak Heart J* 2018; 51 (2):139-44.
  19. Chiu PF Huang CH Liou HH Wu CL Chang C Chang CC et al. Lower-dose warfarin delays renal progression and prolongs patient survival in patients with stage 3–5 chronic kidney disease and nonvalvular atrial fibrillation: a 12-year follow-up study. *Int J Clin Pharmacol Ther* 2014;52:504–8.
  20. Bakris GL, Pitt B, Weir MR, Freeman MW, Mayo MR, Garza D, et al. Effect of patiromer on serum potassium level in patients with hyperkalemia and diabetic kidney disease: the AMETHYST-DN randomized clinical trial. *JAMA* 2015;314: 151-161.
  21. Weir MR, Bakris GL, Gross C, Mayo MR, Garza D, Stasiv Y, et al. Treatment with patiromer decreases aldosterone in patients with chronic kidney disease and hyperkalemia on renin-angiotensin system inhibitors. *Kidney Int* 2016; 90(3):696-704.