

HEART FAILURE CLINICAL OUTCOMES IN HYPONATREMIC VERSUS NORMONATREMIC PATIENTS

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ABSTRACT

Objective: To compare the outcome in heart failure patients between normonatremic and hyponatremic cases in the short term.

Methodology: A cross-sectional study focusing on descriptive statistics at the Department of Cardiology, Lady Reading Hospital Peshawar was performed from 9th August 2011, till 29th April, 2012. Both male and female patients aged 14 years and above admitted diagnosed with heart failure were enrolled and data observed. Those having serum sodium of ≤ 135 mmol/L were defined as hyponatremic. All the patients were managed according to guidelines. All patients were followed during their hospital stay. Patients who survived were discharged on standard HF medications and followed till the end of third month for 3 month mortality and re-admissions for heart failure.

Results: Total study population was 241. Mean age was 59.2 ± 14.9 (18-100) years. Female patients were 51% (123). Mean serum sodium was 136 ± 5.1 mmol/L (116-151). Hyponatremia was present in 35.3% (85) patients. Overall three month follow up mortality was 14.7%, while it was significantly higher in hyponatremic group 22.7% compared to normonatremic patients 10.7% ($P=0.02$). Being followed for a period of 3 months 25% patients were readmitted to hospital with heart failure decompensation. Hyponatremic group had readmission rate of 26.7% compared with 24% in normonatremic patients ($p=0.74$).

Conclusions: Hyponatremia in patients diagnosed with heart failure possess a significant over all risk to a higher mortality as compared to those that are normonatremic. Re-admissions for heart failure are equally common in hyponatremic and normonatremic patients.

Key Words: Hyponatremia, Heart failure, 3-month mortality, Re-admissions.

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INTRODUCTION

Being the most common cause for hospitalization in the elderly an overall 2% of the western society is afflicted and diagnosed with congestive cardiac failure¹. The complications of acute decompensated heart failure (ADHF) are lengthy hospital stay higher readmission rate and increasing morbidity apart from the eventually high mortality²⁻⁴. Hyponatremia, is a relatively common but ignored parameter in these patients⁵. Activation of the various neurohormonal compensatory mechanisms eventually result in a dilute hyponatremia^{6,7}. Even in the general patient admitted for other reason, exists as the most common electrolyte abnormality with a prevalence ranging from 1-45%^{8,9,10-12}. It also predicts poor prognosis cardiac failure patients with relatively preserved ejection fraction¹³. Fluid restriction is the most commonly employed treatment, but is unpredictable and has not been studied clinically in this setting¹⁴.

Hyponatremia is frequently overlooked in heart failure patients. The purpose of this study was to observe the role of correcting hyponatremia in avoiding an adverse impact of this known factor on cardiac failure patients. Although risk stratification alone cannot improve outcomes, identification of patients at high and low risk may improve resource utilization and describing a local profile in a local journal will help local authorities reshape the health care services.

METHODOLOGY

This was a descriptive cross sectional study conducted at Cardiology Department, Post Graduate Medical Institute, Lady Reading Hospital Peshawar from 9th August 2011, till 29th April, 2012. Non-probability consecutive sampling technique was used. Study population included were those Heart Failure (HF) patients who were on heart failure treatment including diuretics for

≥6 month and was admitted with congestive heart failure.

Complete history and physical examination was carried out. The diagnosis of congestive cardiac failure was based upon any two of the following features i.e. orthopnea, exertional dyspnea, paroxysmal nocturnal dyspnea, raised jugular venous pressure, bilateral ankle edema and lung crepitation. Patients with previous diagnosis of chronic renal failure, chronic liver disease, hypothyroidism, nephrotic syndrome were excluded from the study to control bias.

From all patients blood sample were collected and sent to hospital laboratory for serum sodium measurement. All the laboratory investigations were done under supervision of expert pathologists and using same standard laboratory equipment.

All the patients were managed according to guidelines. All patients were followed within the hospital stay. Those who survived the hospital course were discharged on standard HF medications as indicated and were followed up till the end of third month to detect 3 month mortality and re-admissions with heart failure.

Mean \pm SD was calculated for continuous variables. Frequencies and percentages were calculated for categorical variables. Hyponatremia and clinical outcomes were stratified among age and gender to see the effect modifications. P value was calculated with chi square test. All results were arranged and presented in the form of tables and graphs.

RESULTS

A total of 241 patients admitted to cardiology department with decompensation of heart failure were included in the study. Mean age was 59.2 ± 14.9 (18-100) years. Female patients were 123 (51%) and males were 118 (49%). Based on age patients were divided into two groups, Group I included patients less than 60 years and group II included patients 60 years and above. The number of patients in group I were 101 (41.9%), while Group II had 140 (58.1%) patients.

Coronary artery disease was the most common cause of heart failure (58.5%) followed by cardiomyopathy (30.7%) and valvular heart disease (9.5%). Other causes of heart failure were found in 1.2% patients. (Fig2) CAD

Table 1: Baseline Parameters of the study population

Variable	Na >135 mmol/L (n =156)	Na ≤135 mmol/L (n=85)	2-sided p value	Overall (n=241)
Mean age in years \pm SD	59.94 \pm 15	57.8 \pm 14.7		59.2 \pm 14.9
CAD [n(%)]	95 (60.9)	46 (54.1)	0.339	141 (58.5)
Cardiomyopathy [n(%)]	47 (30.1)	27 (31.8)	0.889	74 (30.7)
Valvular heart disease [n(%)]	14 (9)	9 (10.6)	0.655	23 (9.5)
ACE-Inhibitor and/or ARBs at admission [n(%)]	103 (66)	55 (64.7)	0.887	158(65.5)
BB at admission n(%)	51 (32.7)	27 (31.7)	1.00	78 (32.3)
Aldosteron antagonists at admission [n(%)]	78 (50)	44 (51.8)	0.893	122 (50.6)
Loop diuretics at admission [n(%)]	118 (75.6)	66 (77.6)	0.754	184 (76.3)
Digoxin at admission [n(%)]	52 (33.3)	30 (35.3)	0.777	82 (34)
NYHA Class III at admission [n(%)]	46 (29.5)	24 (28)	0.883	70 (29)
NYHA Class IV at admission [n(%)]	110 (70.5)	61 (72)	0.883	171 (71)

Table 2: In-hospital and 3 month follow up outcomes in CHF

Outcome	Na >135 mmol/L (n =150)	Na ≤135 mmol/L (n=75)	2-sided p value	Overall (n=225)
Three month mortality [n(%)]	16 (10.7)	17 (22.7)	0.02	33 (14.7)
3 month follow up Re-admission rate [n(%)]	36 (24)	20 (27)	0.74	56 (25)

was more common in male patients (65.3% vs 52%) while cardiomyopathy and valvular heart disease was common in female patients (33.3% vs 28%) and (13.8% vs 5.1%) respectively. CAD was more common in group II (65.7% vs 48.5%) while cardiomyopathy and valvular heart disease was more frequent in group I (32.7% vs 29.3%) and (15.8% vs 5%) respectively.

Mean serum sodium was 136 ± 5.1 mmol/L (116-151). Hyponatremia (serum sodium ≤ 135 mmol/L) was present in 35.3% (85) patients. Patients admitted with hyponatremia were clinically similar to patients with normal serum sodium concentration in terms of age, gender and NYHA class at admission (Table 2). No difference was observed in the baseline (at the time of admission) use of angiotensin receptor blockers (ARBs), Angiotensin converting enzyme (ACE) inhibitors and/or, Aldosterone antagonists, Beta-blockers (BB) or loop Diuretics. Majority of the patients were in New York Heart Association (NYHA) class IV (71%) (Table 1).

Of the 241 enrolled patients 13 patients died during their hospital admission, the remaining 228 were discharged home after improvement on heart failure treatment. data of three patients was withdrawn as the was lack of adherence to protocol while for those still enrolled (225 patients) a 3 months data was observed for mortality and readmissions for decompensation of heart failure (Algorithm). Overall three month follow up mortality was 14.7%. A significantly higher follow up mortality was noted in hyponatremic group, 22.7% compared to normonatremic patients 10.7% ($p=0.02$). Three month follow up readmissions were 25%. Hyponatremic group had readmissions of 26.7% compared with 24% ($p=0.74$) in normonatremic patients (Table 2). Follow up mortality was higher in group II, (16.8% vs 11.7%, $p=0.34$) and male patients (18.8% vs 10.6%, $p=0.09$). Readmissions were more frequent in Group II (28% vs 21%, $p=0.34$) and male patients (27% vs 23%, $p=0.54$).

DISCUSSION

In our study mean serum sodium was $\pm SD$ 136 ± 5.1 mmol/L. this is similar to what was reported previously in another study (138 ± 5 mmol/L)⁵. In this study the hyponatremia was observed in 35.3% of patients with chronic cardiac failure. In acutely destabilized heart failure patients admitted to hospital a similar number of patients were reported to have hyponatremia (23-27%)^{8,9,15}. The relatively higher frequency of hyponatremia in this study is probably due to the fact that our study population was sicker than earlier studied patients as evident by the higher NYHA (New York Heart Association) class.

In our study 25% patients were readmitted with heart failure during their 3 month follow up period. Hyponatremic group had readmissions of 26.7% compared with 24% in normonatremic patients. Readmissions were

more frequent in Group II and male patients. An analysis from the OPTIMIZE-HF⁵ registry showed 60-90 day re-hospitalization of 32.4%, while in ESCAPE⁹ study 62% patient were re-hospitalized with worsening heart failure. The reason for higher readmission rate in ESCAPE study is that they included only those patients who had persistent hyponatremia and they were followed for a longer time (6 months).

Overall three month follow up mortality was 14.7% in our study population. A higher follow up mortality of 22.7% was noted in patients with hyponatremia as compared to 10.7% in normonatremic patients. The results of this study are similar to OPTIME-CHF¹⁶ Study which showed a higher follow up mortality in CHF patients with lower serum sodium compared to higher serum sodium, but they followed patients only for 60 days while in our study follow up was continued for 3 months. In OPTIMIZE-HF⁵ trial similar group of patients were followed for 60-90 days with follow up mortality of 12.4% vs 7.1% in hyponatremic group. Another study "ESCAPE" reported a higher rate of follow up mortality 31% in hyponatremic group but included only those patients who had persistent hyponatremia and they were followed for a longer time (6 months). The retrospective Enhanced Feedback for Effective Cardiac Treatment (EFECT) study¹⁷ identified 4031 patients admitted for CCF at multiple Canadian hospitals, in-hospital mortality was 8.9%, 30-day mortality 10.7%, and 1-year mortality 32.9.

The high short-term mortality and morbidity rates in patients hospitalized with worsening heart failure and hyponatremia underline the importance of identification of hyponatremia. Based on the outcome and results, it is suggested to conduct further large studies to assess the frequency of hyponatremia and its effect on clinical outcomes outcome in CCF patients in our population.

LIMITATIONS

There were certain study limitations. This was a single center study where follow-up was limited to 3months period, constricting the potential to predict the long term impact on these class of patients. The study sample consists solely of patients with chronic heart failure and relatively preserved renal function. Whether serum sodium concentration would be predictive of outcomes in patients hospitalized for heart failure and advanced renal dysfunction deserves further investigation. Also most of the patients were from low socioeconomic class therefore the study finding cannot be generalized to regional population. In addition the number of patients enrolled in the study was small, therefore larger scale studies are needed to validate the study findings.

CONCLUSION

Hyponatremia in patients diagnosed with heart failure possess a significant over all risk to a higher mortality

as compared to those that are normonatremic. Re-admissions for heart failure are equally common in hyponatremic and normonatremic patients.

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CONTRIBUTORS

FA and MA participated in planning of study, data analysis and manuscript writing. IU, SA and YH helped in data management. MH supervised the study. All authors contributed significantly to the final manuscript.