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Original Research Article

IN HOSPITAL OUTCOMES IN PATIENTS PRESENTING WITH ACUTE DECOMPENSATED HEART FAILURE WITH HYPONATREMIA

PARVEZ M[1], EJAZ M[*2], SADIQ S[1], MUHAMMAD T[1]

[1]*Department of Cardiology, HMC, Hayatabad Medical Complex, Peshawar, Pakistan*
[2]*Department of Cardiology, DHQ Hospital, Nowshera, Pakistan*
**Corresponding author email address:* drmejazkhan1@gmail.com

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ABSTRACT

Background: *Acute decompensated heart failure (ADHF) is characterized by the rapid onset or worsening of symptoms and signs of heart failure, often necessitating urgent hospitalization. Its prevalence continues to rise globally, significantly contributing to increased morbidity and mortality.* ***Objective:*** *To determine the in-hospital outcomes among patients presenting with acute decompensated heart failure and concomitant hyponatremia.* ***Study Design:*** *Descriptive case series.* ***Settings:*** *Department of Cardiology, MTI-Hayatabad Medical Complex, Peshawar.* ***Duration of Study:*** *From 14 June 2022 to 14 December 2022.* ***Methods:*** *Patients meeting the predefined inclusion criteria were prospectively enrolled after obtaining informed written consent from the patients or their caregivers. Clinical assessments and serum sodium levels were monitored during hospitalization, and relevant in-hospital outcomes, including mortality, length of hospital stay, and rehospitalization rates, were meticulously documented.* ***Results:*** *Out of the enrolled cohort, 113 (71.5%) patients had a previous history of hyponatremia. During hospitalization, 54 (34.2%) patients died, 42 (26%) required hospital stays longer than six days, and 32 (20.3%) were rehospitalized after initial discharge.* ***Conclusion:*** *The presence of hyponatremia in patients hospitalized for ADHF at MTI-HMC was strongly associated with adverse clinical outcomes, including high mortality, prolonged hospitalization, and rehospitalization. Therefore, routine monitoring and management of serum sodium levels are strongly recommended for patients admitted with acute heart failure.*

Keywords: Acute Decompensated Heart Failure (ADHF), Hyponatremia, Heart Failure

INTRODUCTION

Acute decompensated heart failure (ADHF) is the rapid onset of, or change in, symptoms and signs of HF. It can be a life-threatening condition that requires immediate medical attention and usually leads to hospitalization. Acute decompensated heart failure continues to rise in prevalence and is associated with substantial mortality and morbidity. In the US, over 1 million patients are hospitalized annually with HF as a primary diagnosis, with an additional 3 million hospitalizations with Heart Failure (HF) listed as a secondary or tertiary diagnosis (1).

The pathophysiology of Acute decompensated heart failure (ADHF) is pleiotropic and dependent on several factors, including the degree of systolic and diastolic cardiac dysfunction, the relative involvement of the right and left ventricles, the arterial and venous vascular tone, the neurohormonal and inflammatory activation state, and comorbid contributing influences (3).

Hyponatremia is a very common electrolyte abnormality associated with poor short- and long-term outcomes in patients with heart failure (HF) (3). Treating physicians should differentiate between depletional versus dilutional hyponatremia. The former is caused by diuretic agents, which enhance sodium excretion, often with concomitant potassium/magnesium losses. This can be treated with isotonic saline, whereas potassium/magnesium administration may be helpful if plasma concentrations are low (4).

In one study, a total of 152 patients admitted with Acute Decompensated Heart Failure (ADHF) were included in the study. The in-hospital mortality rate was 11.4% in patients with hyponatremia. 26.3% of patients were recorded with prolonged hospitalization, i.e, length of hospital stay > 6 days, and 27.0% of patients required re-hospitalization (re-admissions within 48 hours of discharge from hospital), whereas 46.1% were recorded with kidney injury, i.e, GFR ≥90 mL/minute/1.73 m2 (5).

Several studies have shown that hyponatremia is associated with increased risk of rehospitalization and death in patients with heart failure. In these studies, chronic heart failure (CHF) patients with persistent hyponatremia were compared only with CHF patients with a normal sodium level at hospital admission (6).

In conclusion, hyponatremia is one of the crucial factors in the clinical prognosis of heart failure patients [7]

The aim of this study is to determine the in-hospital outcomes in patients presenting with acute decompensated heart failure with hyponatremia. Hyponatremia in patients with Heart Failure (HF) remains a challenge for clinicians, and available treatment options are limited. Therefore, this study will help us determine the in-hospital outcomes in such patients in order to assess its impact on our patients in our local population.

METHODOLOGY

This descriptive case series was conducted at the Department of Cardiology, MTI-Hayatabad Medical Complex, Peshawar, Pakistan, from 14 June 2022 to 14 December 2022. A total sample size of 158 patients was determined using the World Health Organization (WHO) sample size calculator based on an expected proportion of in-hospital mortality of 11.6%, with a 95% confidence interval and a 5% margin of error. Participants were selected through non-probability consecutive sampling.

Patients aged between 50 and 80 years of both genders, who presented with acute decompensated heart failure (ADHF) and concurrent hyponatremia diagnosed according to predefined operational criteria, were eligible for inclusion. Patients unwilling to participate, those without clinical evidence of hyponatremia, and those with other

chronic illnesses such as liver cirrhosis, chronic obstructive pulmonary disease (COPD), or malignancies, including carcinomas and leukemia, were excluded.

Ethical approval was obtained before data collection from the Institutional Ethical Review Committee of MTI-Hayatabad Medical Complex and the Research Evaluation Unit (REU) of the College of Physicians and Surgeons Pakistan (CPSP), Karachi. Eligible patients were recruited from the Cardiology Outpatient Department (OPD) and Coronary Care Unit (CCU). Written informed consent was obtained from all participants or their immediate family members. Comprehensive demographic and clinical data, such as age, gender, contact information, length of hospital stay, serum creatinine levels, systolic and diastolic blood pressure, occupation, education level, social class, smoking history, and comorbid conditions including diabetes mellitus, hypertension, previous episodes of ADHF, and previous hyponatremia, were meticulously recorded using a structured proforma. In-hospital outcomes were systematically documented throughout the patients' hospitalization.

Data entry and analysis were conducted using SPSS version 20.0 (IBM Corp., Armonk, NY, USA). Continuous variables, including age, length of hospital stay, serum creatinine levels, and blood pressure (systolic and diastolic), were reported as mean ± standard deviation. Categorical variables such as gender, occupation status, educational status, social class, diabetes mellitus, hypertension, and previous history of hyponatremia, earlier episodes of ADHF, smoking status, and hospital outcomes were summarized as frequencies and percentages. Stratified analysis was performed to examine potential effect modifications by gender, previous history of ADHF and hyponatremia, occupation, education, social class, diabetes mellitus, hypertension, and smoking status. Chi-square tests were utilized post-stratification to evaluate statistical significance, with a p-value of <0.05 considered significant. Results were presented using relevant graphs and tables.

RESULTS

The present study included 158 patients, with a mean age of 65.00 ± 5.59 years (Table 1). The average hospital stay was 4.70 ± 2.12 days. Most patients were male (89.2%), aged below 65 years (69.6%), employed (66.5%), and literate (64.6%) (Table 2). The majority belonged to the poor socioeconomic class (56.3%), while diabetes mellitus (70.9%), previous hyponatremia (71.5%), smoking (80.4%), and hypertension (77.8%) were common comorbidities.

In-hospital outcomes showed that 54 patients (34.2%) experienced mortality, 30 (19.0%) developed kidney injury, 42 (26.6%) had a prolonged hospital stay, and 32 (20.3%) required re-hospitalization. Stratification of outcomes (Table 3) revealed that mortality was higher among patients aged below 65 years (72.2%) compared to those above 65 years (27.8%) (p = 0.083). It was significantly associated with higher occupation status among employed individuals (74.1%) (p = 0.025). Mortality was slightly higher among literate patients (63.0%) compared to illiterate ones (37.0%) (p = 0.624), and more common among poor-class patients (68.5%). Diabetes mellitus, previous hyponatremia, smoking, and hypertension were also associated with higher mortality, though without statistically significant differences. Other adverse outcomes, such as kidney injury, prolonged stay, and re-hospitalization, were consistently more frequent in patients with multiple comorbidities.

Table 1: Descriptive Statistics of Study (158)

Numerical Variables	Mean	Std. Deviation
Age (Years)	65.00	5.593
Length of Hospital Stay (Days)	4.70	2.122
Systolic BP (mmHg)	108.59	4.335
Diastolic BP (mmHg)	66.69	6.486
Serum Creatinine (mg/dL)	1.954	2.4945

Table 2: Baseline Demographic, Clinical Characteristics, and In-Hospital Outcomes of Study Participants (n = 158)

Variable	Categories	Frequency (n)	(%)
Age Group	< 65 years	110	69.6%
	> 65 years	48	30.4%
Gender	Male	141	89.2%
	Female	17	10.8%
Occupation Status	Employed	105	66.5%
	Unemployed	53	33.5%
Educational Status	Literate	102	64.6%
	Illiterate	56	35.4%
Social Class	Poor	89	56.3%
	Middle Class	30	19.0%
	Rich	39	24.7%
Diabetes Mellitus	Yes	112	70.9%
	No	46	29.1%
Previous History of Hyponatremia	Yes	113	71.5%
	No	45	28.5%
Smoking Status	Yes	127	80.4%
	No	31	19.6%
Hypertension	Yes	123	77.8%
	No	35	22.2%
In-Hospital Outcomes	In-Hospital Mortality	54	34.2%
	Kidney Injury	30	19.0%
	Length of Stay (> 6 Days)	42	26.6%

Table 3: Stratification of In-Hospital Outcomes Based on Demographic and Clinical Variables (n=158)

Stratification Variable	Category	In-Hospital Mortality n(%)	Kidney Injury n(%)	Length of Stay >6 Days n(%)	Re-Hospitalization n(%)	P-Value (Mortality)
Age Group	<65 Years	39 (72.2%)	20 (66.7%)	24 (57.1%)	27 (84.4%)	0.083
	>65 Years	15 (27.8%)	10 (33.3%)	18 (42.9%)	5 (15.6%)	
Gender	Male	48 (88.9%)	29 (96.7%)	36 (85.7%)	28 (87.5%)	0.498
	Female	6 (11.1%)	1 (3.3%)	6 (14.3%)	4 (12.5%)	
Occupation	Employed	40 (74.1%)	21 (70.0%)	20 (47.6%)	24 (75.0%)	0.025
	Unemployed	14 (25.9%)	9 (30.0%)	22 (52.4%)	8 (25.0%)	
Educational Status	Literate	34 (63.0%)	17 (56.7%)	30 (71.4%)	21 (65.6%)	0.624
	Illiterate	20 (37.0%)	13 (43.3%)	12 (28.6%)	11 (34.4%)	
Social Class	Poor	37 (68.5%)	11 (36.7%)	24 (57.1%)	17 (53.1%)	0.145
	Middle Class	9 (16.7%)	9 (30.0%)	6 (14.3%)	6 (18.8%)	
	Rich	8 (14.8%)	10 (33.3%)	12 (28.6%)	9 (28.1%)	
Diabetes Mellitus	Yes	42 (77.8%)	24 (80.0%)	26 (61.9%)	20 (62.5%)	0.159
	No	12 (22.2%)	6 (20.0%)	16 (38.1%)	12 (37.5%)	

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Previous Hyponatremia	Yes	41 (75.9%)	21 (70.0%)	31 (73.8%)	20 (62.5%)	0.586
	No	13 (24.1%)	9 (30.0%)	11 (26.2%)	12 (37.5%)	
Smoking Status	Yes	43 (79.6%)	23 (76.7%)	35 (83.3%)	26 (81.3%)	0.912
	No	11 (20.4%)	7 (23.3%)	7 (16.7%)	6 (18.8%)	
Hypertension	Yes	37 (68.5%)	25 (83.3%)	33 (78.6%)	28 (87.5%)	0.172
	No	17 (31.5%)	5 (16.7%)	9 (21.4%)	4 (12.5%)	

DISCUSSION

In this study, we found that in-hospital mortality occurred in 34.2% of patients with acute decompensated heart failure (ADHF) and hyponatremia, a figure considerably higher than reported in recent literature. For instance, Alataş et al. (2021) observed an in-hospital mortality rate of 17.3% among ADHF patients, highlighting the severe prognosis associated with concurrent hyponatremia in our cohort (8). Similarly, a multicenter registry-based study by Savarese et al. (2020) showed an overall mortality of 15.9% in hospitalized heart failure patients, significantly lower than our findings (9). The higher mortality in our study could be attributed to the higher prevalence of comorbidities, such as diabetes mellitus (70.9%), hypertension (77.8%), and smoking (80.4%), which have all been associated with worse outcomes in heart failure (10,11).

Interestingly, our data showed that patients aged below 65 years experienced higher mortality (72.2%) compared to those above 65 years (27.8%), although this association was not statistically significant (p=0.083). Traditionally, older age is considered a risk factor for poor outcomes in heart failure. For example, Kapoor et al. (2021) demonstrated that patients older than 70 years had significantly higher mortality than their younger counterparts (12). However, our study's reversal in age trends might be due to the earlier onset of severe comorbidities in the younger Pakistani population, as reported by Gul et al. (2022), who described early cardiovascular aging patterns among South Asian individuals (13).

Gender-wise, males accounted for 88.9% of mortalities in our study, yet the difference compared to females was not statistically significant (p=0.498). Similar gender disparities have been observed previously; according to Metawee et al. (2022), male patients with ADHF were more likely to experience adverse in-hospital outcomes, although females tend to have worse long-term prognosis (14).

Employment status was significantly associated with mortality (p=0.025), with employed individuals exhibiting higher mortality (74.1%). This contrasts with findings by Akinboboye et al. (2023), who reported that unemployment was linked to poorer outcomes in heart failure patients, largely due to socioeconomic stress and reduced healthcare access (15). The divergence may be context-specific to our study population, where employed individuals possibly delay seeking care due to work commitments, leading to worsened conditions at presentation.

Among comorbidities, the presence of diabetes mellitus was notable, with diabetic patients showing a higher proportion of mortality (77.8%) compared to non-diabetics (22.2%). This aligns with findings by Yancy et al. (2022), who reported that diabetes increases mortality risk in heart failure patients by 35% (16). Similarly, a previous history of hyponatremia was also associated with greater mortality (75.9%), consistent with data from the ESC-HF Long-Term Registry, which indicated hyponatremia as an independent predictor of death in hospitalized heart failure patients (17).

Smoking was highly prevalent (80.4%) among the study cohort. Although the association with mortality was not statistically significant, other studies have consistently reported smoking as a major modifiable risk factor for adverse heart failure outcomes. In a study by Shin et al. (2022), active smokers with heart failure had a 45% higher risk of hospitalization and death compared to non-smokers (18). Hypertension was present in 77.8% of patients, and those with hypertension accounted for 68.5% of mortalities. Although the association was not statistically significant (p=0.172), hypertension remains a well-established risk factor for heart failure exacerbations and mortality, as confirmed by McDonagh et al. (2021) (19).

Overall, our study highlights that despite improvements in heart failure management globally, patients with hyponatremia and multiple comorbidities in low- and middle-income countries like Pakistan continue to experience significantly high in-hospital mortality and adverse outcomes. Our findings reinforce the urgent need for early identification of high-risk patients and aggressive multidisciplinary management to improve survival rates.

CONCLUSION

This study found a high in-hospital mortality rate of 34.2% among patients with acute decompensated heart failure and hyponatremia. Mortality was significantly associated with employment status, while other factors like younger age, male gender, diabetes, smoking, and hypertension showed notable trends without statistical significance. These findings underscore the need for early risk identification and comprehensive management strategies to improve outcomes in this vulnerable population.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethical approval and consent to participate

Approved by the department Concerned. (IRBEC-HMC-099-21)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declared an absence of conflict of interest.

AUTHOR CONTRIBUTION

MUZDALFA PARVEZ

Conception of Study, Development of Research Methodology Design, Study Design, manuscript Review, and final approval of manuscript.

MUHAMMAD EJAZ

Manuscript revisions, critical input.

Manuscript drafting.

Conception of Study, Final approval of manuscript.

SUMAYYA SADIQ

Data entry, data analysis, and drafting the article

TAYYEB MUHAMMAD

Study Design, Review of Literature.

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