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Original Article

In-Hospital Mortality in Hyponatremia Patients Hospitalized for Heart Failure at National Institute of Cardiovascular Disease (N.I.C.V.D) Karachi

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ABSTRACT

Heart failure is a clinical syndrome that appears when the heart either is unable to sustain a sufficient cardiac output or can only do so at the cost of an increased filling pressure. Hyponatremia is poor prognostic sign. **Objective:** To determine the frequency of in-hospital mortality in hyponatremic patients hospitalized for heart failure at National Institute of Cardiovascular Disease (N.I.C.V.D) Karachi. **Methods:** This cross sectional study was conducted at Department of Cardiology, NICVD, Karachi, Pakistan from 1st March 2018 to 31st August 2018. All patient who fulfilled the inclusion criteria were enrolled and consent was taken. All the patients were managed according to guidelines and followed during hospital stay for in-hospital mortality. Data were collected in proforma. **Results:** The in-hospital mortality was 13(9.09%). Lower admission serum sodium was associated with high mortality. **Conclusions:** Patients hospitalized with heart failure frequently had hyponatremia, which was linked to greater in-hospital mortality. Severe hyponatremic patients have worse clinical outcomes.

INTRODUCTION

Heart failure is the end result from most of heart disease. Proper diagnosis is crucial to identify specific treatment for specific conditions. Heart failure typically results in protracted impairment, is frequently brought on by ischemic heart disease. Heart failure is more common as people get older, increasing from 1% in people 50 to 59 to over 10% in people 80 to 89. Older people with heart failure patients has more hospital stay and mortality. Heart failure has an extremely dismal prognosis although it somewhat depends on the underlying source of the issue but overall it has worse prognosis [1]. According to Starling's Law, cardiac output depends on myocardial contractility, preload (the volume and pressure of blood in the ventricle at the end of diastole), and afterload (the volume and pressure of blood in the ventricle during systole). The main anomaly in patients without valvular disease is impaired ventricular function, which causes a decrease in cardiac output. When ventricular performance is reduced, this triggers counter-regulatory neurohumoral systems that, under normal physiological conditions, would support heart function but instead can cause an imbalance between then afterload and preload. Because any further decline in cardiac output will result in increased neurohumoral activation and peripheral vascular resistance, a vicious cycle may be created [2]. The underlying type of cardiac disease, the type of heart failure it elicited, and the neurohumoral changes that have emerged all affect the clinical picture. Presence of

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hyponatremia in heart failure patients has a poor predictive value. Hyponatremia may result due to medication, improper water retention, or ion pump failure in the cell membrane. Decreased BP, chilly periphery, and reduced cardiac output result in weariness, lethargy, and poor effort tolerance. Blood flow is diverted away from skeletal muscle to maintain perfusion of critical organs, which may lead to weakness [3, 4]. Chronic heart failure is usually result in weight loss (cardiac cachexia), which is brought on by a confluence of hunger, poor tissue perfusion brought on by low cardiac output, and skeletal muscle atrophy brought on by immobility [5, 6]. Due to the paucity of data we have done this study to make local guide lines.

METHODS

This cross sectional study was conducted at Department of Cardiology, NICVD, Karachi, Pakistan from 1st March 2018 to 31st August 2018. By using WHO calculator with confidence level of 95% with error of margin 4.5% and anticipated in-hospital mortality around 8.2% sample size was 143. We enrolled 143 patients by using non probability consecutive sampling of either gender, aged 50 to 65 years and hyponatremic patients with Heart failure (HF) hospitalized for at least 10 days as per operational definition. We excluded previous history of thrombolytic therapy, previous history of coronary angioplasty or CABG, deranged LFT (ALT>40IU, AST>40IU) and RFT (creatinine>1.2mg/dl). After approval of study from ethical committee, informed consent were taken from all the patients admitted with heart failure in N.I.C.V.D for using their data in research. Demographic were noted. All those who fulfill the inclusion criterion were included in study otherwise excluded. Factors such as hypertension, diabetes mellitus and smoking were noted. Under aseptic condition 5cc blood was drawn for labs and hyponatremia was labelled as serum sodium level <130 mmol/L. All the collected data were entered and analyze into SPSS version 16.0. Frequency and percentages were calculated for qualitative data like sex, Diabetes Mellitus, Hypertension, smoking status and outcome in-hospital mortality. Mean and standard deviation was calculated for quantitative data like age, weight, height, BMI, serum sodium level and length of hospital stay. Effect modifiers like age, sex, diabetes mellitus, hypertension, smoking status, BMI, serum sodium level were controlled by stratification. Chi-square test applied to see the effect of these on in-hospital mortality and p-value ≤ 0.05 was taken as significant.

RESULTS

This study includes 143 patients with mean age was 58.2 ± 14.2 years. Mean Serum sodium level in hyponatremic heart failure patients was 128.5 ± 4.5nmol/L and mean BMI was 27.6 ± 4.2 kg/m2 (Table 1).

Table 1: Descriptive Statistics (N=143)

Variables	Mean ± SD
Age	58.2±14.5
Sodium level	128.5±4.5
Body mass index	27.6±4.2

A total of 90(62.93%) patients were male whereas 53(37.06%) patients were female. 53(37.06%) patients were having age less than 50 years while 90(62.93%) patients have more than 50 years of age. Diabetes mellitus were found in 66(46.15%) patients while 70(48.95%) patients were hypertensive, smoking status showed that 51(35.66%) patients were smokers, while 60(41.95%) patients were overweight and obese, 40(27.97%) patients had </=130 nmol/L serum sodium level and 103(72.02%) patients had >130 nmol/L sodium level (Table 2).

Table 2: Distribution of Qualitative Variables (N=143)

Variables		Frequency (%)
Age groups	≤ 50 years	53 (37.06)
	>50 years	90 (62.93)
Gender	Male	90 (62.93)
	Female	53 (37.06)
Diabetes Mellitus	Yes	66 (46.15)
	No	77 (53.84)
Hypertension	Yes	70 (48.95)
	No	73 (51.04)
Smoking status	Yes	51 (35.66)
	No	92 (64.33)
BMI	≤ 25 kg/m2	83 (58.04)
	>25 kg/m2	60 (41.95)
Sodium level	≤ 130 nmol/L	40 (27.97)
	>130 nmol/L	103 (72.02)

The in-hospital mortality was 13(9.09%), 9(22.5%) patients died during hospital stay have sodium level <130 nmol/L while 4(3.9%) patients died during hospital stay have >130 nmol/L. Lowest sodium level patients showed significant effect on mortality with p-value=0.001 (Table 3).

Table 3: Stratification for In-Hospital Mortality according to Serum Sodium Level (n=143)

Serum sodium level	In-hospital mortality		Total	p-value
	Yes	No		
≤ 130 nmol/L	9	31	40	0.001
	22.5%	77.5%	100%	
> 130 nmol/L	4	99	103	
	3.9%	96.1%	100.0%	
Total	13	130	143	
	9.1%	90.9%	100.0%	

DISCUSSION

Heart failure remains one of the most catastrophic phenomenon with higher morbidity and mortality. It may be the manifestation of many underlying causes includes structural and vascular disorders .In patients with ischemic heart disease both systolic and diastolic dysfunction frequently coexist [7, 8]. In this study we have 143 patients with mean age of 58.2±14.5 years and among them

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40(27.97%) developed hyponatremia this is consistent with the findings by Ahmad *et al.*, where he observed mean age was 59.2 ± 14.9 years and hyponatremia was found in 85 (35.3%) this was in agreement with observation of Mohammad *et al.*, who diagnosed in 24% patients with hyponatremia little higher percentage of hyponatremia in our study may be due to NYHA class IV heart failure was very frequent [9, 10]. Similarly many earlier studies have reported hyponatremia in 22-27% patients in decompensated heart failure [11, 12]. We found more male dominance with a number of 90 (62.93%) and it was also in agreement with the study where 60% were male patients [13]. Diabetes accounts for 66(46.15%) while Diaconu and Bartos [14] observed 29.26% similar results were observed by Einarson *et al.*, who found 32% it was also in agreement with the findings by Triposkiadis *et al.*, who noted 35.0% patients with diabetes mellitus this little variation may be due to different population and sampling [15, 16]. In this study 70(48.95%) patients were hypertensive it was in agreement with study by Palo and Barone who found 45% patients were with hypertension [17]. While 51(35.66%) patients were smokers, 60(41.95%) patients were overweight and obese, 40(27.97%) were there. In this study overall in-hospital mortality was 13(9.1%) it was higher in patients with hyponatremia 9(22.5%) as compared to normal serum sodium group where it was 4(3.9%). Similar results was reported by Mullens and Abrahams who observed hyponatremia was associated with higher in-hospital mortality (19.78% of persistent hyponatremic patients) compared with normonatremic patients (1.48%) [18]. Additionally, it agreed with Gheorghiade *et al.*, who found that patients hospitalized for heart failure had an overall in-hospital mortality rate of 3.8% [19]. In the hyponatremic group, mortality was reported to be 6.0%, compared to 3.2% in the normonatremic group. However, 5.9% in-hospital mortality in the hyponatremia group was reported by Klein *et al.*, [20]. Higher mortality number in our study may be because the patients in our study have higher NHY class and were sick at time of admission.

CONCLUSIONS

This study concluded that mortality was more seen in hyponatremic patients with heat failure as compared to patients with normal sodium level. So it is concluded that hypornatremia proves to be important short term and long term prognostic factor.

Authors Contribution

Conceptualization: Y, S, AF, JS, TS
Methodology: Y, S, FA, M, AR
Formal Analysis: AF
Writing-review and editing: FA, M, N, AR, JS
All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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