SOCIODEMOGRAPHIC, CLINICO-LABORATORY CHARACTERISTICS WITH SHORT OUTCOME AMONG ACUTE HEART FAILURE PATIENTS ADMITTED FOR FIRST TIME IN A TERTIARY CARE HOSPITAL: A REAL LIFE EXPERIENCE

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Abstract

Acute heart failure is one of the common causes of morbidity & mortality among the patients admitted in hospital. This prospective observational study was done to characterize socio-demographic, clinical & laboratory characteristics with short clinical outcome. Total 110 patients of acute heart failure were included in this study where mean age was 53.88 (± 14.6) years. Majority of the patients were aged between 51-60 years 35 (32%). 79(72%) of them smoker and 12(11%) were alcoholic. Major comorbidities were hypertension 59 (53.63%), ischemic heart disease 42 (38.18%), DM 39(35.45%), chronic kidney disease 25(22.72%). Most common symptoms at presentation were shortness of breath110(100%) along with palpitation 96(87.27%), orthopnea 85(77.27%), paroxysmal nocturnal dyspnea 59(53.63%), ankle edema 71(64.54%), raised JVP 75(68.18%), bilateral basal crepitation on auscultation 80(72.72%), anemia 19 (17.27%) & oliguria 23(20.90%) where mean duration of symptoms was 11 ± 2 days. Lab investigations revealed decreased Hemoglobin (10.71 ± 1.49) g/dl, proteinuria in 31 (28.18%), ketone body 5 (4.5%), raised creatinine in 23(20.93%), hyponatremia 38 (34.54%), hypernatremia 6 (5.45%), hypokalemia 6 (5.45%), hyperkalemia 3 (2.72%). Regarding cardiac events 37(33.63%) encounter myocardial infarction, cardiogenic shock 29(26.36%), Cardiac arrhythmia 27 (24.5%), cardiac arrest 6 (5.45%), non-cardiac events like stroke 6(5.45%), hyperosmolar hyperglycemic state 2(1.8%), diabetic ketoacidosis 5(5.45%), acute kidney injury 23(20.90%). However, among cardiac arrhythmia atrial fibrillation found 13(11.81%) followed by multiple ventricular ectopic 12 (10.90%), ventricular tachycardia 7 (6.36%), Complete heart block 6 (5.45%), variable heart block 4 (3.63%), long QT 2(1.8%). Regarding short clinical outcome 52(47.27%) were improved, 40 (36.36%) had persistent symptoms & rest 18 (16.36%) expired. Most common causes of those deceased person were cardiogenic shock 9(50%) followed by cardiac arrest 6 (6.33%). In conclusion we can say clinical characteristics are more or less similar but those who have reduced ejection fraction with comorbidities are very prone to develop cardiac arrhythmia causing sudden cardiac death in heart failure.

Key Words: *Heart failure, Cardiac arrhythmia, electrolyte imbalance.*

Introduction:

Heart failure(HF) is a leading cause of morbidity and mortality and causes high health care related costs, posing a great burden on both patient and society and accounts for more than 1 million primary and about 3 million secondary annual hospital admissions in the USA alone and it is the most common hospital discharge diagnosis among subjects older than 65 years. The incidence and prevalence of HF rise steeply with age in those aged over 60 years. The most often mentioned prevalence estimate for the

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adult population at large is 2% (1–3%), and 5–9% selectively in those aged 65 years and over.[1-3] Subjects with congestive heart failure (CHF) usually show acid–base and electrolyte disorders, due both to the activation of several neuro-hormonal mechanisms and to drugs used in this condition, such as diuretics. These abnormalities reflect the severity of heart failure and contribute to the functional impairment and to the poor long-term prognosis. [4]

The common electrolyte abnormalities are hyponatremia, hypokalemia, and hypo-magnesemia. Hypercalcemia and hypo-magnesemia also are observed in patients with diabetes, hypertension, and obesity.[5] Patients with cardiac insufficiency are often administered diuretic therapy that may further exacerbate ion imbalances.[6] The acid–base disturbances generally observed are metabolic alkalosis pure or combined with respiratory alkalosis.[4] Several mechanisms interact to produce these alterations. The decrease in cardiac output leads directly to a reduction in renal blood flow, with impairment of renal excretion of water and electrolytes, and it causes the activation of several neurohormonal responses that affect both cardiovascular homeostasis and electrolyte balance. The therapy of CHF subjects includes the discovery and management of these electrolyte abnormalities that have a role in the development of ventricular arrhythmias. [4]

HF often coexists with a number of prognosis-relevant comorbidities and has direct consequences on other organs, including the kidneys. The relationship of renal function with congestive heart failure (CHF), as highlighted by type I and type II cardio renal syndromes (CRS), is present in both chronic heart failure syndromes as well as acute decompensated heart failure (ADHF). Increasing recognition of the syndrome has revealed a growing incidence of Type I and II as well as the prognostic importance of each, i.e. renal dysfunction in the setting of congestive heart failure portends an independently worse outcome compared to those with preserved renal function.[7] Progression of HF or kidney disease can have deleterious effects on patient outcomes through the activation of vicious cycles that often accelerate cardiac and renal deterioration. Thus, the heart and kidneys interact in a complex and interdependent manner in both acute and chronic conditions, which can lead to dual organ dysfunction.[8, 9]

The highest risk group for rapid progression of renal dysfunction was the individuals with an eGFR> 90 ml/min at baseline.[10] So, it appears that preserved renal function does not protect an individual with systolic dysfunction from developing worsening renal function and those that have renal dysfunction have a poorer prognosis than those with stable, preserved renal function.

Weiner, et al concluded after evaluating the associations between baseline and change in renal function and cardiovascular events that the presence of abnormal renal function, even with some degree of variability where there is biochemical improvement is associated with increased cardiovascular morbidity.[11]

For that reason, knowing initial status of electrolyte and renal function is essential for further management and or long-term outcome. Considering the paucity of the literature, the study was planned to assess clinical, laboratory especially electrolyte & renal function in acute heart failure patients during hospital admission followed by short clinical outcome. The study findings will help the physician to know the current status of these groups of patients and eventually help the patients.
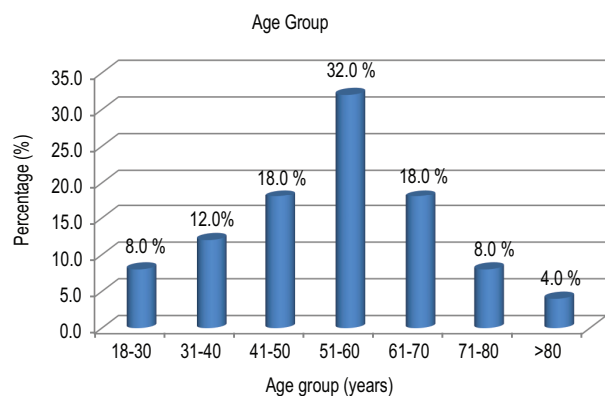
Methodology

It's a prospective observational study conducted in Medicine department of Dhaka medical college hospital from 2019 July to 2019 December. All acute heart failure [12, 13] patients those who admitted in medicine ward for the first time were included in this study. Sampling technique was purposive, convenient. Sample size came up to 384 based on prevalence equation.[14] However; we enrolled 110 patients in 6 months. Face to face interview was conducted by using a semi-structured questionnaire containing socio-demographic parameters and clinical presentations. Detailed history, clinical examinations, investigations like CBC, Urine R/E, C S. Creatinine, S.

electrolyte, like (Na, K, Cl, HCO3, Ca & Mg), ECG, Chest X-ray, USG of renal system & Echocardiography where needed. We assessed their clinical symptoms as a marker of improvement before hospital discharge. Data were collected in a semi structured questionnaire form along with informed consent by acting doctor who were assigned for this study. Ethical clearance was taken from ethical review committee of respective medical college. All data were analyzed by SPSS 23 version & presented as table, & bar diagram. Measurement data of normal distribution was expressed as mean ± standard deviation. All counts and measurement data were descriptive statistics, and the results were expressed as percentages.

Result

Total 110 patients of acute heart failure were included in this study. Mean age was 53.88 (± 14.6) years. Maximum and minimum age was 82 years and 23 years respectively. Majority of the patients were aged between 51-60 years (32.0%). See Figure-1. Among all subjects, 83 (75.45 %) were male with male-female ratio 3:1. Co-morbidities of patients of our study population showed that hypertension 59 (53.63%), ischemic heart disease 42 (38.18%), DM 39(35.45%), chronic kidney disease 25(22.72%), dyslipidaemia 20 (18.18%), anaemia 19 (17.27%), asthma/COPD 14 (12.72%), atrial fibrillation 13(11.83%), peripartum cardiomyopathy 5 (4.54%), SLE 4 (3.64%) & Tuberculosis 2 (1.8%). (Table 1).

Table-I

Co-morbidities among heart failure patients (n=110)

Co-morbidities	Frequency	Percentage
Hypertension	59	53.63
Ischemic Heart Disease	42	38.18
Diabetes mellitus	39	35.45
CKD	25	22.72
Dyslipidaemia	20	18.18
Anaemia	19	17.27
Asthma/ COPD	14	12.72
Atrial fibrillation	13	11.81
Hyperthyroid	5	4.54
Peripartum cardiomyopathy	5	4.54
SLE	4	3.64
Tuberculosis	2	1.81

Regarding personal habits of study population, 79(72%) of total patients had history of smoking and 12(11%) were alcoholic. 45(41%) patients lead a sedentary lifestyle. All 110 (100%) patients had shortness of breath along with palpitation 96(87.27%), orthopnea 85(77.27%), Paroxysmal nocturnal dyspnea 59(53.63%), ankle edema 71(64.54%), raised JVP 75(68.18%), bilateral basal crepitation on auscultation 80(72.72%), anaemia 19 (17.27%) & oliguria 23(20.90%) (Table 2). Mean duration of symptoms 13 ± 2 days. It is found that mean pulse rate was 85.6 ± 8.7 bpm, mean systolic BP was 117.2 ± 10 mmHg and diastolic BP was 79.5 ± 7.7 mmHg. Moreover, 77(70%) were classified into Heart failure with reduced ejection faction (Table 2). Lab investigations revealed decreased Hemoglobin (10.71 ± 1.49) g/dl, proteinuria in 31 (28.18%), ketone body 5 (4.5%), raised creatinine in 23(20.93%), hyponatremia 38 (34.54%), hypernatremia 6 (5.45%), hypokalemia 6 (5.45%), hyperkalaemia 3 (2.72%) (Table 3). Regarding cardiac events 37(33.63%) encounter myocardial infarction, cardiogenic shock 29(26.36%), Cardiac arrhythmia 27 (24.5%), cardiac arrest 6 (5.45%), non-cardiac events like stroke 6(5.45%), hyperosmolar hyperglycemic state 2(1.8%), diabetic ketoacidosis 5(5.45%), acute kidney injury 23(20.90%). However, among cardiac arrhythmia, Atrial fibrillation found 13(11.81%)

Fig.-1: *Age distribution of patients with heart failure (n=110)*

followed by multiple ventricular ectopic 12 (10.90%), ventricular tachycardia 7 (6.36%), Complete heart block 6 (5.45%), variable heart block 4 (3.63%), long QT 2(1.8%) (Table 4). Regarding short outcome 52(47.27%) were improved, 40 (36.36%) symptoms were persistent, 18 (16.36%) expired. Cause of those deceased person were cardiogenic shock 9(50%), cardiac arrest due to Ventricular fibrillation 6 (33.33%), DKA 2 (11.11%) & hemorrhagic stroke 1 (5.5%) (Table 5).

Table-II

Important clinical characteristics of heart failure patients (n=110)

Important Clinical signs	Frequency	Percentage
Shortness of breath	110	100
Palpitation	96	87.27
Orthopnoea	85	77.27
Bilateral basal crepitation	80	72.72
Raised JVP	75	68.18
Ankle edema	71	64.54
Paroxysmal nocturnal dyspnea	59	53.63
Atrial fibrillation	13	11.81
Anaemia	16	14.54%
Oliguria	23	20.91%
Clinical Type (based on Echo)		
HF with reduced	77	70
EFHF with preserved EF	33	30

Table-III

Important laboratory findings among heart failure patients during admission

Trait	Mean±SD	Frequency N (%)
Hemoglobin	10.71±1.49	
Proteinuria (present)		31 (28.18)
Urine for ketone body		5 (4.5%)
Creatinine	1.29±0.79	
RBS	9.53 ± 2.54	
Sodium	133.56 ± 6.08	
Hyponatremia		38 (34.54)
Hypernatremia		6 (5.45)
Potassium	4.79 ± 0.68	
Hyperkalaemia		3 (2.72)
Hypokalaemia		6 (5.45)
HCO3	22.07 ± 4.01	
Metabolic acidosis		17 (15.45)

Table - IV

Cardiac & Non Cardiac Events occurred during index admission of along with heart failure patients (N=110)

Events	Frequency	Percentage
Shock	29	26.36
Myocardial infarction	37	33.63
Cardiac arrhythmia	27	24.5
Multiple ventricular ectopic	12	10.90
VT	7	6.36
Complete Heart Block	6	5.45
Variable Heart Block	4	3.63
Cardiac arrest	6	5.45
Hypokalaemia with (Long QT)	2	1.8
Hyperkalaemia	3	2.7
Non Cardiac Events		
Acute kidney injury	23	20.90
Stroke	6	5.45
Ischemic (Cardio embolic)	5	4.5
Hemorrhagic	1	0.9
Hyperglycemia		
HHS	72	6.41.8
DKA	5	4.5

Table -V

Clinical outcome among acute heart failure patients (N=110)

Outcome	Frequency	Percentage
Clinically improved	52	47.27
Persistent of symptoms	40	36.36
Death	18	16.36
Cardiogenic shock	9	50
Cardiac arrest	6	33.33
DKA	2	11.11
Hemorrhagic stroke	1	5.5

Discussion

Total 110 patients with acute heart failure who admitted first time in a tertiary care hospital were included. Majority of our patients were

aged between 51-60 years (32.0%) followed by 18% in 41-50 years and another 18% in 61-70 years both of which were second highest. Kabiruzzaman et al. in Bangladesh found the mean age was 54.1±15.3 years with majority (30.7%) patients in 51-60 years group (15). Abedin et al. also found similar result but Rahaman et al. found mean age 46±7 years with majority (75%) patients in 51-70 years group.[16,17] Sex distribution of patients was slightly in favour of males (75.45%) than female (24.54%) with male female ratio 3:1. Kabiruzzaman et al., Abedin et al. and Araújo et al. also got similar result with male predominance.[15, 16] In our study, as a co-morbid condition, about 54% had history of hypertension, 38% had ischemic heart disease, 35% had DM, 18% had dyslipidaemia, 17% had anaemia, 13% had primary respiratory problems and rest 11.81% had history of atrial fibrillation. In the study of Rahman et al. found similar result as hypertension (45%), diabetes (29%), respiratory disease (27%) and atrial Fibrillation in 9%.[16] In SOLVD (1991) clinical trial, 42% had hypertension, 26% had diabetes, 10% had Atrial Fibrillation and in MERIT-HF clinical trial, 44% had hypertension, 25% had diabetes and 17% had atrial fibrillation. [18.19] Regarding personal habits of study population, 72% of total patients were smoker and only 12% were alcoholic and 41% patient leads a sedentary lifestyle. Noori et al. found 55% were current smoker among readmission population which was similar to our study.[20] In this study, 100% patients presented with shortness of breath, 92% had bilateral basal crepitation on auscultation, 80% had orthopnoea, 66% had raised JVP, 64% had bilateral ankle edema, 54% had paroxysmal nocturnal dyspnoea and only 10% had oliguria. Rahman et al. and Barasa et al. also found same result. [17, 21]

In the present study, mean pulse rate was 83.6±8.7 bpm, mean systolic BP was 117.2±10 mmHg and diastolic BP was 79.5±7.7 mmHg. Dokainish et al. found regarding clinical characteristics, systolic blood pressure 115.2 ±22mmHg, diastolic blood pressure 76±13 mmHg and heart rate 81±17 bpm which is very much similar to us.[22] Tsutsui et al. also found similar result as heart rate 70.5±12.0 bpm,

systolic blood pressure 117.0±18.6 mmHg and diastolic blood pressure 66.1±11.6 mmHg.[23] In our study we found that, hyponatraemia was present in 34.54% of the patients while 5.45% had hypenatraemia. Barasa et al. found hyponatraemia was present in 35.6% of the patients while 7.4% had hypernatraemia.[21] Hyponatraemia is particularly common in CCF and OPTIMIZE-HF registry recorded that 25.3% of 47,647 heart failure patients had hyponatraemia on admission which also supports our study.[24] Hyponatraemia generally identifies CHF patients in more advanced stages of the syndrome and, thus, a more activated neuro-hormonal system. [25] Hypokalaemia in relation to hyponatraemia was less common affecting 5.45% patients followed by hyperkalaemia in 2.72% patients. Barasa et al. showed hypokalaemia and hyperkalaemia were present in 7.4% and 2.9% patients of their study.[21] Hypokalemia has been associated with a poor prognosis in patients with CHF. Thus, it is likely that hypokalemia is as much a marker of other pathophysiologic factors or of the severity of CHF itself as it is an isolated predictor of adverse events. [25]

Frequency of acute kidney injury (AKI) in congestive cardiac failure showed 20.90% patients of CCF patients developed AKI. Depending on the population, 27–40% of patients hospitalized for ADHF develop acute kidney injury (AKI). [9] This figure is lower than that found by Ghonemy et al. who got 47% patients with CHF had developed AKI. [26] Regarding CKD in our study population, 22.72% of total patients had chronic kidney disease (CKD). Ahmed et al. and Ezekowitz et al. also showed 37% and 39% patients with CCF developed chronic kidney disease respectively which is almost similar to our study. [27, 28)

However, among cardiac arrhythmia Atrial fibrillation found 13(11.81%) followed by multiple ventricular ectopic 12(10.90%), ventricular tachycardia 7(6.36%), Complete heart block 6 (5.45%), variable heart block 4 (3.63%), long QT 2(1.8%) Huikuri HV et al [29] & Masarone D et al. [30] found almost similar but Lip GYH et al. [31] found same arrhythmia but percentage were different. Regarding short

clinical outcome we found 52(47.27%) were improved, 40 (36.36%) symptoms were persistent, 18 (16.36%) expired, Cause of those deceased person were cardiogenic shock 9(50%), cardiac arrest due to Ventricular fibrillation 6 (33.33%), DKA 2 (11.11%) & hemorrhagic stroke 1 (5.5%). A systematic death review found that overall, 62% of underlying causes of death were cardiovascular, with a large proportion (25%) of underlying causes attributable to CHD. Progressive pump failure was the major non-CHD cause of cardiovascular death (16% of all underlying causes). Respiratory disease (infectious and noninfectious) was the leading underlying cause of noncardiovascular death (10%), followed by cancer (9%). [32]

Our study has some limitations like small sample size, prospective observational but for short duration. It will be better if it was prospective longitudinal cohort.

Conclusion:

Clinical characteristics of HF are more or less similar but those who have reduced ejection fraction with comorbidities are very prone to develop cardiac arrhythmia. It might be due to structural change or electrolyte imbalance. We should always consider diabetes, stroke, renal impairment and cardiac arrhythmias as risk factor for increased mortality among heart failure patients. Nevertheless, this small study is an effort to describe clinical presentation of acute heart failure with short clinical outcome, large scale study needed to find out exact situation of heart failure in Bangladesh.

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