Clinical Characteristics of Acute Heart Failure Patients

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Background: Hospitalized heart failure (HHF) is a challenging clinical entity in cardiology. Data on HHF patients from the Middle East is scarce. Observational studies may provide an initial insight that could improve disease management and guide the design of future clinical trials.

Objective: To evaluate the management, in-hospital mortality, and one-year readmission predictors of HHF patients admitted to the coronary care unit.

Setting: Coronary Care Unit, Salmaniya Medical Complex, Bahrain.

Design: A Prospective Study.

Method: Two hundred forty-five HHF patients were included in the study. Clinical data during hospitalization and upon discharge were recorded from 1 January 2012 to 31 March 2012. Follow-up was extended for 12-months for readmissions with heart failure (HF).

Result: One hundred seventy (69%) were males, and the mean age was 64 years. The main causes of HF decompensation were non-compliance 59 (24%), myocardial ischemia 51 (21%) and hypertensive crisis 39 (16%). Comorbidities included were systemic hypertension, 179 (73%), hyperlipidemia, 166 (68%), and diabetes mellitus, 161 (64%). The mean left ventricular ejection fraction (EF) was 34%. In-hospital mortality rate was 9.4%. Patients who were taking angiotensin receptor blockers (ARB) before admission had reduced in-hospital mortality. Upon discharge, 213 (87%) patients were taking renin-angiotensin system blockers, 170 (69%) were taking beta-blockers, and 66 (27%) were taking mineralocorticoid receptor antagonist (MRA). The rate of readmission with HF was 47% at one year.

Conclusion: HHF patients in this study have multiple comorbidities and an increased in-hospital mortality. In-hospital mortality-related variables and predictors of HF readmission should be verified in a larger population and employed in clinical practice, as these factors might help to improve patient outcome.

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Heart failure (HF) is a major global problem[1]. Studies have helped in understanding this clinical entity and define areas where the quality of care is deficient[2-5]. The paucity of data outside of North America and Europe is the main challenge[6]. Shortcomings and barriers to the implementation of evidence-based therapy could not be analyzed without defining these types of gaps in knowledge.

Hospitalized heart failure (HHF) is defined as a new-onset or worsening (gradual or rapid) of HF signs and symptoms that require urgent therapy and result in hospitalization[7].

The aim of this study was to evaluate the management, in-hospital mortality, and one-year readmission predictors of HHF patients admitted to the coronary care unit.

METHOD

All consecutive patients above the age of 18 years hospitalized with heart failure (HHF) from 1 January 2012 to 31 March 2012 were included in the prospective study; follow-up was extended to 31 March 2013 for readmissions of HF. The patients with the following conditions were excluded: severe aortic stenosis, severe mitral stenosis, peripartum cardiomyopathy, and heart failure due to medical illness (such as sepsis or thyroid disease).

The following variables were documented: age, gender, height, weight, body mass index (BMI), diabetes mellitus (DM), systemic hypertension (HTN), stroke, dyslipidemia, renal impairment defined as glomelular filtration rate (GFR)

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< 60 ml/min, history of coronary artery disease (CAD) and atrial fibrillation (Afib), causes of decompensation, basic hemodynamic parameters (admission heart rate (HR) and blood pressure (BP)), hemoglobin and creatinine level, left ventricle ejection fraction (LVEF), medications, length of stay and in-hospital mortality. Upon discharge, basic hemodynamics (discharge HR and BP) and medications were documented. Compliance to medications was verified by reviewing the chart, follow-up visits, and central hospital pharmacy dispensary desk information. During the follow-up period, only some of the HHF patients were seen. Within each hospitalization, the same variables were traced. Ethical approval of the institute was obtained.

Statistical Analysis

P-value of <0.05 was considered significant. Frequencies, as well as differences between groups, were analyzed using Pearson's chi-squared test or Fisher's exact test. The analysis was done using Student's t-test. Multivariable logistic regression (MLR) was performed to determine the predictors of readmission with heart failure and in-hospital mortality.

RESULT

The mean age was 64.5+13.5 years. One hundred seventy (69%) patients were male. HTN was the most common comorbidity, 179 (73%), followed by hyperlipidemia, 166 (68%), and DM, 161 (64%). CAD was seen in more than half of the patients, 127 (52%), more than one-third had renal impairment, 80 (33%) and one-fifth had Afib, 54 (22%). Twenty-four (10%) patients sustained a stroke, see table 1. The mean left ventricular ejection fraction (EF) was 34% (HF with reduced EF 60%, HF with preserved EF 16 %, and HF with midrange EF 24%), see figure 1.

Table 1: Clinical Characteristics of Patients Enrolled in HHF Registries and our Data

Characteristics	Our Data (N=245)	Gulf Care (N=5,005)	EFICA (N=581)	ATTEND (n=1,110)	EHFS-II (N=3M580)	OPTIMIZE-HF (N=48,612)
Timeframe	2012	2012	2001	2007-2011	2004-2005	2003-2004
Age, Years (mean)	64.5+_13.5	59+_15	73+_13	73+_14	70+_13	73+_14
Male	69	63	59	58	61	48
Ischemic Etiology	21	27	61	31	54	46
Hypertensive Etiology	16	15	15	18	-	23
Comorbidities	-	-	-	-	-	-
DM	64	50	27	34	33	42
HTN	73	61	60	69	63	71
Dyslipidemia	68	36	30	37	-	32
CAD	52	47	-	-	54	-
Atrial Fibrillation	22	12	25	40	39	31
CKD	36	15	53	-	17	19.6
Admission HR	101+_24	97+_23	-	99+_29	95 (77-114)	87+_22
Admission SBP	155+_42	137+_34	126+_39	145+_37	135 (118-159)	144+_33
Admission DBP	89+_22	81+_20	71+_22	-	-	75+_19.1
Ejection Fraction	34+_14	35 (25-45)	38+_15	-	38+_15	39+_17.6
Creatinine	120+_60	130+_117	-	123+_140	-	156+_137
Hemoglobin	12+_2	12.6	-	12+_2.6	-	12+_2.04

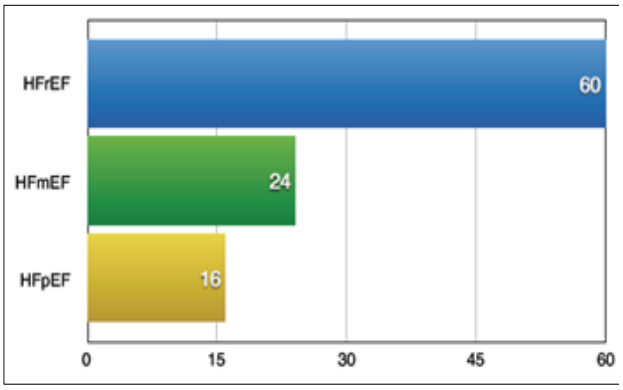

Figure 1: Distribution of Enrolled Patients Based on Their Ejection Fraction

Precipitating Causes of Decompensation

The causes of decompensation were as follows: non-defined, non-adherence to medications, myocardial ischemia and hypertensive crisis, see table 2.

Table 2: Factors Identified as Precipitating Factors for HHF

Factors Identified as Precipitating Cause of HHF	Our Data (N=245)	Gulf Care (N=5,005)	EFICA (N=581)	EHFS-II (N=3M580)	OPTIMIZE-HF (N=48,612)
Ischemia	21	27	42	30	14.7
Poor Compliance	24	21.2	7	22	11.1
Infection	11	15	20	17.6	-
Hypertension	16	8.2	8	-	10.7
Undefined	30	14	8	-	-
Other	-	-	25	26.8	12.7
Arrhythmia	-	6	25	32	13.5

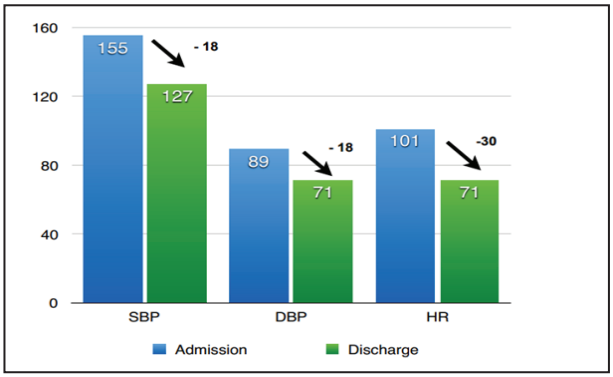

Figure 2: Hemodynamic Parameters for Admission and Discharge of HHF Patients

Systolic BP (SBP), diastolic BP (DBP) and HR were 155+42 mmHg, 89+22, and 101+24 beats per min (bpm), respectively. At discharge, SBP, DBP, and HR were 127 mmHg, 71 mmHg and 71 bpm, respectively; see figure 2.

All patients were admitted to the CCU. The average hospital stay was seven days, see figure 3. The mean hemoglobin was 12 g/dl and serum creatinine was 120 mmol/L, see table 1. Two-hundred-forty (98%) patients received intravenous loop

diuretics (furosemide) in boluses form, 29 (12%) had the furosemide as continuous infusions. One hundred seven (44%) received intravenous nitrates and 10 (4%) received inotropes. Twenty-four (10%) were mechanically ventilated. The rate of renin-angiotensin system (RAS) blockers, beta-blockers and mineralocorticoid receptor antagonist (MRA) had increased at discharge compared to the rate at initial hospitalization. The rest of the medications are shown in table 3.

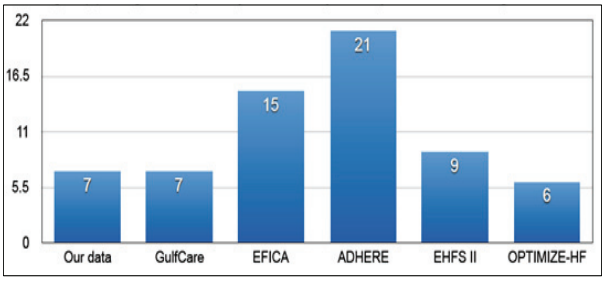

Figure 3: Length of Stay in Days in Our Study Compared to Other Registries

Table 3: Percentage of Admission and Discharge Cardiac Medications in the Registries

	Our Data (N=245)		Gulf Care (N=5,005)		EFICA (N=581)		ATTEND (n=1,110)		EHFS-II (N=3M580)		OPTIMIZE-HF (N=48,612)	
	A	D	A	D	A	D	A	D	A	D	A	D
ACE Inhibitors	69	61	43	61	42	57	18	26	55	71.1	40	53
ARB	17	26	13	17	3	3	38	46	9.3	10.4	12	12
B Blockers	31	69	44	71	13	21	26	64	43.2	61.4	53	64
Loop Diuretics	98	86	58	94	87	79	44	84	-	-	61	-
MRA	13	27	17	43	18	19	24	58	28.1	47.5	-	7
Digitals	6	7	17	25	16	17	16	28	26.6	31	23	-
CCB	13	19	13	16	10	14	30	27	17.8	14.6	-	-
Nitrate	44	15	26	38	50	35	26	24	27.7	32.9	22	-
Antiarrhythmic	6	7	2.5	4.7	29	27	-	-	12.9	17.6	10	-
Aspirin	89	83	62	81	43	45	38	50	42.9	49.4	40	-
Warfarin	3	15	12	19	12	16	24	40	24	33.1	22.7	-
Statin	77	76	51	72	13	18	23	39	28.4	41.8	31.8	33

A: Admission **D:** Discharge

The mortality rate was 9.4%. There was a significant association between in-hospital mortality and the following factors: age, HR at admission >100 bpm, length of stay, evidence of stroke, CAD, renal impairment, and elevated serum creatinine. Receiving an angiotensin receptor blocker (ARB) at admission was negatively associated with in-hospital mortality, see figure 4.

Readmission with Heart Failure

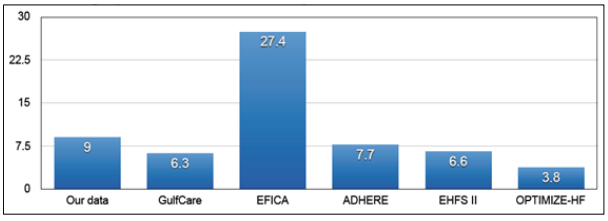

Figure 4: In-Hospital Mortality for Patients Admitted with Heart Failure in Our Data and Other Heart Failure Registries

At one year, 115 (47%) patients had at least one readmission with heart failure. The following readmission predictors were identified by multiple logistic regression, including HR of ≥78 bpm at discharge (AOR) 2.36 (95% CI 1.37–4.07; p= 0.05), diabetes mellitus (AOR) 1.88 (95% CI 1.01–3.24; p= 0.05) and CAD (AOR) 1.81 (95% CI 1.04–3.40; P-value= 0.05).

DISCUSSION

The mean age was 65+14 years, which was similar to other studies in developing countries[6]. Patients in heart failure studies in North America, Europe, and Japan tended to be older[2-5]. The regional age variation is well-known and can be partially explained by the prevalence of underlying risk factors in different societies.

Male predominance is almost a universal trend except in the Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure (OPTIMIZE-HF)[5]. Females constitute a large proportion of heart failure population in the United States[5].

Precipitating causes for decompensation for heart failure could reflect underlying etiology. Myocardial Ischemia represented 21% of the incidents, much less than reported in other studies[2-5]. Administration of therapeutic heparin in 63% of the patients could indicate that myocardial ischemia is under-reported. Comorbidities can increase the risk of myocardial ischemia in this population. Underutilization of coronary angiograms and non-invasive workups (such as coronary computed tomography angiogram or dobutamine echocardiogram) for myocardial ischemia during the initial admission might explain our findings.

In our study, HTN triggered 16% of the acute heart failure episodes. HHF is a common presentation of hypertensive crisis in Bahrain[8,9]. DM was seen in 64% of patients. Across the spectrum of cardiovascular diseases, diabetes amplifies the risk and worsens the prognosis[10,11]. More than 50% of the patients had CAD. We found CAD to be an independent readmission predictor for HF. One-fifth of the patients had Afib reflecting the high prevalence of systemic HTN in the cohort. Renal impairment was seen in 33%. Adding to its prognostic implication, initiation, and increase in evidence-based therapy could be limited in the presence of impaired renal function[12].

BP at initial presentation in our study was the highest compared to other studies. The mean LVEF was 34.4+14 SD with the majority being HF with reduced ejection fraction (HFREF). Patients with HF of mid-range EF (HFMEF) comprised 26%; such category might represent an intermediate stage in the remodeling process of hypertensive heart diseases. The outcome of this group is to be verified by further clinical research[13].

Other than MRA, the rate of adherence to evidence-based therapy is observed in the majority of patients. Because 33% have renal impairment, the risk of hyperkalemia is a concern when using RAS blockers or MRA. In-hospital initiation of beta-blockers and angiotensin converting enzyme inhibitors (ACE-I) is an important predictor for long-term compliance for both and should be advocated[14-17].

The median length of stay was seven days, and in-hospital mortality was 9.4%. In other studies, the median length of stay ranges from 4 to 28 days and in-hospital mortality from 4% to 30%[1].

We found a median length of stay beyond seven days to be closely related to in-hospital mortality[1]. Studies with lower hospital stay have lower mortality[1]. Variables of mortality, such as age, HR >100 bpm at admission, CAD, and non-cardiac morbidities are similar to other studies[18-24]. Our findings of reduced mortality with prior ARB therapy was similar to a study from Japan[4]. Readmission predictors in our study were as follow: HR of ≥78 bpm at discharge, DM and CAD. Predicting readmission is more challenging than predicting mortality due to HHF.

The limitation of this study was the small size sample. Bahrain has 1.2 million inhabitants. With an estimated heart failure prevalence of 2.5%, the total number of patients in Bahrain with this disease would be approximately 30,000. A sample of 245 patients has a 95% confidence level and 6.24 CI representative ability. In addition, the quality of documentation needs to be improved.

CONCLUSION

Our patients are relatively younger than those from the studies in North America, Europe, and Japan, and they had several comorbidities. In-patient mortality and 12-month readmission rates were 9.4% and 47%, respectively.

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Competing Interest: None.

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REFERENCES

1. Ambrosy AP, Fonarow GC, Butler J, et al. The Global Health and Economic Burden of Hospitalizations for Heart Failure: Lessons Learned from Hospitalized Heart Failure Registries. J Am Coll Cardiol 2014; 63(12):1123-1133.
2. Nieminen MS, Brutsaert D, Dickstein K, et al. EuroHeart Failure Survey II (EHFS II): A Survey on Hospitalized Acute Heart Failure Patients: Description of Population. Eur Heart J 2006; 27(22):2725-36.
3. Zannad F, Mebazaa A, Juillière Y, et al. Clinical Profile, Contemporary Management and One-Year Mortality in Patients with Severe Acute Heart Failure Syndromes: The EFICA Study. Eur J Heart Fail 2006; 8(7):697-705.
4. Sato N, Kajimoto K, Keida T, et al. Clinical Features and Outcome in Hospitalized Heart Failure in Japan (from the ATTEND Registry). Circ J 2013; 77(4):944-51.
5. Gheorghiade M, Abraham WT, Albert NM, et al. Systolic Blood Pressure at Admission, Clinical Characteristics, and Outcomes in Patients Hospitalized with Acute Heart Failure. JAMA 2006; 296(18):2217-26.
6. Sulaiman K, Panduranga P, Al-Zakwani I, et al. Clinical Characteristics, Management, and Outcomes of Acute Heart Failure Patients: Observations from the Gulf Acute Heart Failure Registry (Gulf CARE). Eur J Heart Fail 2015; 17(4):374-84.
7. Gheorghiade M, Pang PS. Acute Heart Failure Syndromes. J Am Coll Cardiol 2009; 53(7):557-73.
8. Al-Bannay R, Husain AA. Hypertensive Crisis. Clinical Presentation, Comorbidities, and Target Organ Involvement. Saudi Med J 2010; 31(8):916-20.
9. Al Bannay R, Böhm M, Husain A. Heart Rate Differentiates Urgency and Emergency in Hypertensive Crisis. Clin Res Cardiol 2013; 102(8):593-8.
10. Al Bannay R, Husain A, Böhm M, et al. Outcomes after Hypertensive Crisis: Comparison between Diabetics and Nondiabetics. IJC Metabolic & Endocrine 7 (2015) 25–30.
11. Emerging Risk Factors Collaboration, Sarwar N, Gao P, et al. Diabetes Mellitus, Fasting Blood Glucose Concentration, and Risk of Vascular Disease: A Collaborative Meta-Analysis of 102 Prospective Studies. Lancet 2010; 375(9733):2215-22.
12. Damman K, Valente MA, Voors AA, et al. Renal Impairment, Worsening Renal Function, and Outcome in Patients with Heart Failure: An Updated Meta-Analysis. Eur Heart J 2014; 35(7):455-69.
13. Ponikowski P, Voors AA, Anker SD, et al. 2016 ESC Guidelines for the Diagnosis and Treatment of Acute and Chronic Heart Failure: The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure of the European Society of Cardiology (ESC). Developed with the Special Contribution of the Heart Failure Association (HFA) of the ESC. Eur J Heart Fail 2016; 18(8):891-975.
14. Bonow RO, Ganiats TG, Beam CT, et al. ACCF/AHA/AMA-PCPI 2011 Performance Measures for Adults with Heart Failure: A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Performance Measures and the American Medical Association-Physician Consortium for Performance Improvement. Circulation 2012; 125(19):2382-401.
15. Gattis WA, O'Connor CM, Gallup DS, et al. Predischarge Initiation of Carvedilol in Patients Hospitalized for Decompensated Heart Failure: Results of the Initiation Management Predischarge: Process for Assessment of Carvedilol Therapy in Heart Failure (IMPACT-HF) Trial. J Am Coll Cardiol 2004; 43(9):1534-41.
16. Gheorghiade M, Gattis WA, Lukas MA, et al. Rationale and Design of the Initiation Management Predischarge: Process for Assessment of Carvedilol Therapy for Heart Failure (Impact-Hf) Study. Am Heart J 2003; 145(2 Suppl): S60-1.
17. Butler J, Arbogast PG, Daugherty J, et al. Outpatient Utilization of Angiotensin-Converting Enzyme Inhibitors among Heart Failure Patients after Hospital Discharge. J Am Coll Cardiol 2004; 43(11):2036-43.
18. Fonarow GC, Abraham WT, Albert NM, et al. Age- and Gender-Related Differences in Quality of Care and Outcomes of Patients Hospitalized with Heart Failure (from OPTIMIZE-HF). Am J Cardiol 2009; 104(1):107-15.
19. Rossi JS, Flaherty JD, Fonarow GC, et al. Influence of Coronary Artery Disease and Coronary Revascularization Status on Outcomes in Patients with Acute Heart Failure Syndromes: A Report from OPTIMIZE-HF (Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure). Eur J Heart Fail 2008; 10:1215–23.

20. Mountantonakis SE, Grau-Sepulveda MV, Bhatt DL, et al. Presence of Atrial Fibrillation is Independently Associated with Adverse Outcomes in Patients Hospitalized with Heart Failure: An Analysis of Get with the Guidelines-Heart Failure. Circ Heart Fail 2012; 5(2):191-201.
21. Fonarow GC, Abraham WT, Albert NM, et al. Dosing of Beta-Blocker Therapy Before, During, and After Hospitalization for Heart Failure (from Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure). Am J Cardiol 2008; 102(11):1524-9.
22. Greenberg BH, Abraham WT, Albert NM, et al. Influence of Diabetes on Characteristics and Outcomes in Patients Hospitalized with Heart Failure: A Report from the Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure (OPTIMIZE-HF). Am Heart J 2007; 154(2):277.e1-8.
23. Mentz RJ, Fiuzat M, Wojdyla DM, et al. Clinical Characteristics and Outcomes of Hospitalized Heart Failure Patients with Systolic Dysfunction and Chronic Obstructive Pulmonary Disease: Findings from OPTIMIZE-HF. Eur J Heart Fail 2012; 14(4):395-403.
24. Abraham WT, Fonarow GC, Albert NM, et al. Predictors of In-Hospital Mortality in Patients Hospitalized for Heart Failure: Insights from the Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure (OPTIMIZE-HF). J Am Coll Cardiol 2008; 52(5):347-56.