Heart Failure Patient Profiles, Management and Outcome: Results from a Heart Failure Clinic Registry

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ABSTRACT

Background: Heart failure (HF) is a global pandemic, but data from South Asia, particularly Bangladesh, are scarce. Understanding regional patient characteristics and risk factors is critical for improving outcomes. Therefore, this study aimed to characterize the clinical profile of patients with HF at a tertiary care center in Bangladesh and to identify the independent predictors of 1-year all-cause mortality.

Methods: We conducted a retrospective cohort study using data from a heart failure registry at a single tertiary care hospital in Bangladesh. Data were collected from the medical records of 1,536 patients registered between 2020 and 2024. The primary outcome was all-cause mortality at 1 year. Multivariable logistic regression analysis was performed to identify independent predictors of mortality.

Results: A total of 1,536 patients were included (mean age 53.2±6.5 years; 84% male). The majority of patients had HF with reduced Ejection Fraction (73%) and were in NYHA class II (85%) at their first visit. The most prevalent comorbidities were coronary artery disease (59%) and diabetes (55%). Guideline-directed medical therapy was common, with 88% of patients on beta-blockers and 49% on Angiotensin Receptor-Neprilysin Inhibitor. The crude 1-year mortality rate was 15%. After multivariable adjustment, key independent predictors of mortality included the presence of renal failure and advanced NYHA classes at follow-up.

Conclusions: In this large, single-center Bangladeshi cohort, patients with HF presented at a relatively young age with a high burden of comorbidities. The 1-year mortality rate was substantial. These findings highlight the need for targeted interventions focusing on high-risk subgroups to improve patient outcomes in this region.

Background

Heart failure (HF) is a clinical syndrome with symptoms and/or signs caused by a structural and/or functional cardiac abnormality and is corroborated by elevated natriuretic peptide levels and/or objective evidence of pulmonary or systemic congestion [1]. The estimated prevalence of HF in the adult population is 1% to 2%, increasing to >10% in older adults worldwide [2-4]. HF often leads to gradual or acute changes in symptoms that require repeated and prolonged hospitalization, which is a strong predictor of poor outcomes [5]. A European registry reported 1-year mortality rates of 29% for patients hospitalized with acute HF [6].

While HF is a global challenge, most large-scale registries and clinical trials have been conducted in North American and European populations [7]. There is a critical evidence gap in low- and middle-income countries, particularly in South Asia [8,9]. The multinational ASIAN-HF registry revealed marked regional variations in patient characteristics, management, and outcomes across Asia, underscoring the need for country-specific data [10,11].

In Bangladesh, previous reports suggest a rising prevalence and pattern of heart failure [12,13]. However, comprehensive data on patient profiles, management, and predictors of outcomes are limited. This study aims to leverage a large single-center registry to characterize a contemporary cohort of HF patients and identify factors associated with mortality in Bangladesh.

Methods
Study Design and Settings
This was a retrospective cohort study conducted at the Department of Cardiology, United Hospital, a large, specialized tertiary care hospital in Dhaka, Bangladesh. Data were extracted from the hospital's dedicated heart failure registry for all eligible patients registered between January 1, 2020, and December 31, 2024.

Participants and Survey Procedures
Patients were included if they were adults (≥18 years) with a physician-confirmed diagnosis of heart failure based on clinical evaluation and echocardiographic evidence. We primarily selected a total of 1,700 patient records for analysis. After excluding records with incomplete baseline or follow-up information (n=164), a final sample of 1,536 patients was included for analytical exploration (Figure 1).
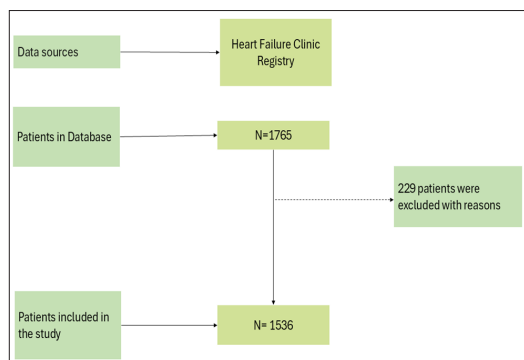

Figure 1: Flow chart for patients' selection

Variables and Data Sources
Data were abstracted from the electronic medical records within the heart failure registry using a standardized data collection form.
- **Baseline Characteristics:** Information on patient demographics, comorbidities, coronary risk factors, and medications was collected from the initial visit record.
- **Clinical and Echocardiographic Parameters:** NYHA class, ECG findings (rhythm, QRS duration), and echocardiographic measurements (LVIDD, LVIDs, PASP, LVEF) were recorded.
- **Operational Definitions:** Key variables were defined according to established guidelines. For example, Heart

Failure with reduced Ejection Fraction (HFrEF) was defined as LVEF <40%, Heart Failure with mid-range Ejection Fraction (HFmEF) as LVEF 40-49%, and Heart Failure with preserved Ejection Fraction (HFpEF) as LVEF ≥50%. Comorbidities such as coronary artery disease (CAD) and renal failure were defined based on documented physician diagnoses, procedural reports, or relevant laboratory criteria (e.g., eGFR <60 ml/min/1.73m² for renal failure).

Outcomes
The primary outcome was all-cause mortality within 1 year of the initial visit. Secondary outcomes included hospitalization for HF. Vital status was ascertained from hospital records and follow-up clinical notes.

Statistical Analysis
The collected data were checked for completeness and consistency. Data were analyzed using SPSS version 23. Categorical variables are presented as frequencies and percentages, while continuous variables are presented as means and standard deviation (SD).

To identify the independent predictors of 1-year all-cause mortality, a multivariable logistic regression model was developed. Variables were selected for inclusion in the model based on clinical relevance and findings from prior literature. These included age, sex, key comorbidities (diabetes, renal failure, CAD), LVEF category, and baseline medication use. Results from the regression model are presented as Adjusted Odds Ratios (aOR) with corresponding 95% Confidence Intervals (CI). The analysis of missing data was handled by performing a complete-case analysis.

Results
Participant's Basic Characteristics
A total of 1,536 patients with heart failure were included. The majority were male (84%, n=1292) and older than 55 years (62%, n=949), with a mean age of 53.2±6.5 years (Table 1).

Table 1: Patients' Basic Characteristics (N=1536)

Characteristics	Frequency	Percentage
Gender		
Male	1292	84.11
Female	244	15.89
Age in years (mean ±SD 53.2±6.5)		
<18	4	0.26
18-30	25	1.63
31-55	558	36.33
> 55	949	61.78
Monthly Income (BDT)		
<20000	112	7.29
20000-40000	199	12.96
40000-60000	629	40.95
>60000	596	38.80

Patient's Clinical Characteristics
At the initial visit, most patients (85%, n=1309) were in NYHA class II. However, at the last recorded visit, a significant proportion had progressed to NYHA class III (86%, n=1331). The majority of patients (73%, n=1123) had HFrEF (Table 2).

Table 2: Patient's Clinical Characteristics (n=1536)

Variables	Frequency	Percentage
The New York Heart Association (NYHA) classification (first visit)		
Class I	70	4.56
Class II	1309	85.22
Class III	145	9.44
Class IV	12	0.78
The New York Heart Association (NYHA) classification (last visit)		
Class I	11	1.00
Class II	142	9.00
Class III	1331	86.00
Class IV	69	4.00
Electrocardiogram (ECG)		
Rhythm (n=1466)		
Sinus	1440	98.23
Atrial Fibrillation (AF)	26	1.77
Bundle Branch Block (n= 321)		
Right Bundle Branch Block (RBBB)	89	27.73
Left Bundle Branch Block (LBBB)	228	71.03
Left anterior fascicular block (LAHB)	4	1.24
Heart Block (n=35)		
First degree	33	94.29
Third degree	2	5.71
ECG QRS duration (milli second) (n=1449)		
< 130 ms	941	64.94
130 – 140 ms	190	13.11
> 150 ms	318	21.95
Echocardiogram (Echo)		
Left ventricular internal diameter end diastole (LVIDD) (in milli meter) (n=1529)		
30-40 mm	49	3.21
41-50 mm	348	22.76
51-60 mm	688	45.00
> 60 mm	444	29.04
Left ventricular internal diameter end systole (LVIDs) (in milli meter) (n=1526)		
20-30 mm	118	7.73
31-40 mm	383	25.10
41-50 mm	573	37.55
Out of Range (< 20)	452	29.62

Pulmonary artery systolic pressure (PASP) (in milli meter) (n=994)		
< 30 mm	527	53.02
30-40 mm	275	27.67
41-50 mm	75	7.55
> 50 mm	117	11.77
Category of Heart Failure (n=1536)		
Heart failure with reduced ejection fraction (HFrEF)	1123	73.11
Heart Failure with mid-range ejection fraction (HFmEF)	138	8.98
Heart failure with preserved ejection fraction (HFpEF)	108	7.03
Heart failure with improved ejection fraction (HFimpEF)	161	10.48
Others	6	0.39
6-minute walk test (before)		
Poor	161	10.50
Fair	190	12.00
Good	963	63.00
Very Good	222	14.50
6-minute walk test (after)		
Poor	122	8.00
Fair	131	8.50
Good	986	64.00
Very Good	297	19.50

Comorbidities and Risk Factors
The burden of comorbidities was high. The most common comorbid conditions were coronary artery disease (CAD) (59%, n=903), renal failure (17%, n=256), and asthma (9%, n=140) (Figure 2). Hypertension (68%) and diabetes (55%) were the most prevalent coronary risk factors (Figure 3).
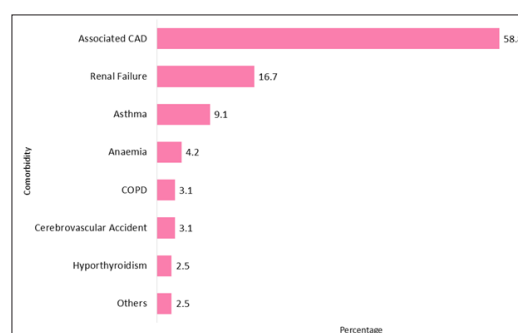

Figure 2: List of common co-morbid diseases that co-exist with HF patients

Ischemia
Overall, 1246 patients (81%) were diagnosed as ischemic patients.

Management
Guideline-directed medical therapy was widely used, with antiplatelets (94%), beta-blockers (88%), and diuretics (72%)

being the most common prescriptions. Notably, 63% of patients received SGLT2 inhibitors and 49% received an Angiotensin Receptor-Neprilysin Inhibitor (ARNI) (Figure 5). Device therapy was infrequent, with only 78 patients (5%) receiving an AICD or CRTD (Figure 6).
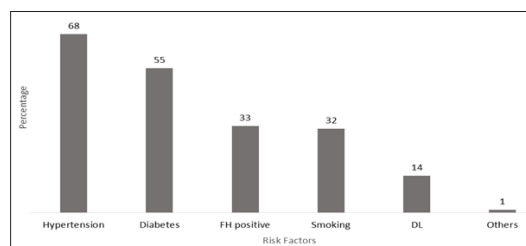

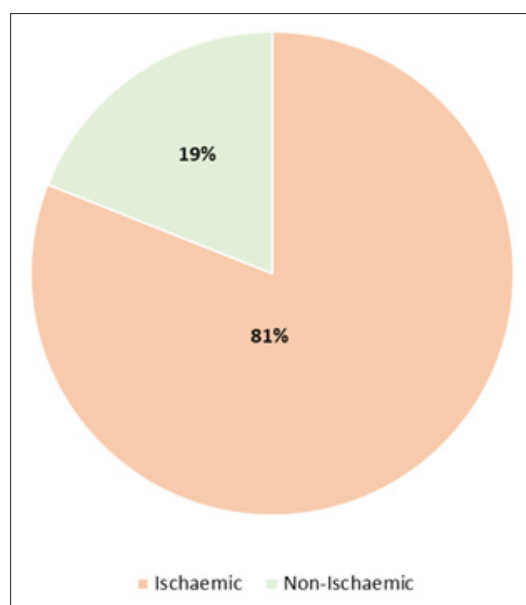**Figure 3:** List of coronary risk factors

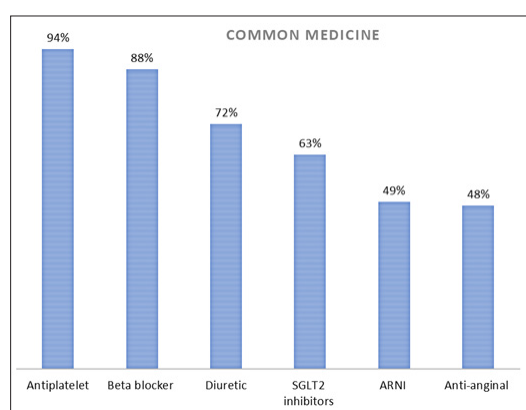**Figure 4:** Patients' presentation with ischemia

Figure 5: History of medication

Outcome

During the follow-up period, 172 patients (11%) were hospitalized for HF (Figure 7). A total of 226 patients (15%) died, with 72% of deaths attributed to cardiovascular causes (Figure 8).
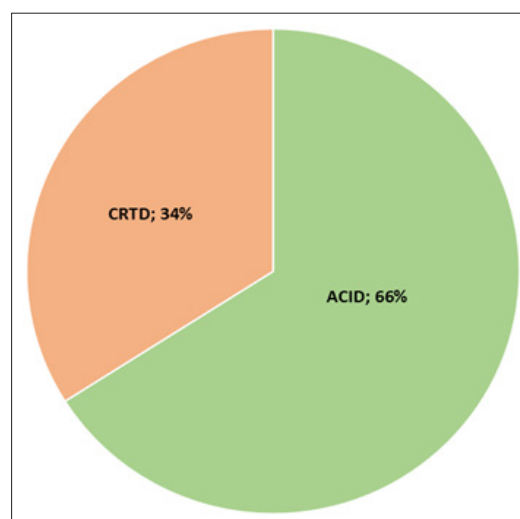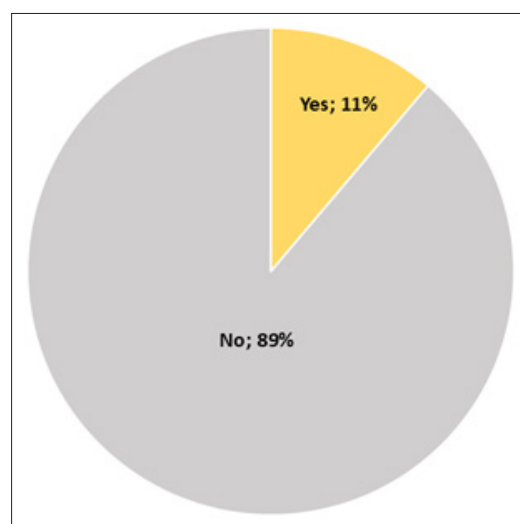

Figure 6: Received device therapy

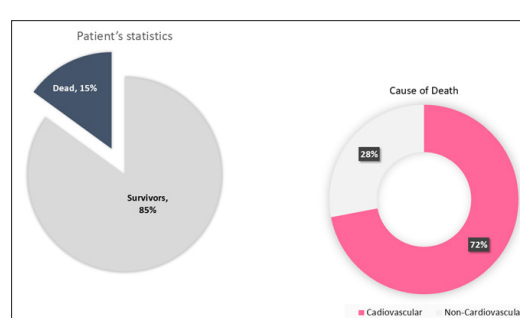**Figure 7:** Hospitalisation history

Figure 8: Patient death history

Predictors of 1-Year Mortality

In the multivariable logistic regression analysis, several factors emerged as independent predictors of 1-year all-cause mortality. After adjusting for age, sex, LVEF, and baseline medications, the presence of renal failure and a higher NYHA classification at the last follow-up visit were strongly associated with an increased risk of death. The illustrative results of this model are presented in Table 3.

Table 3: Illustrative Multivariable Analysis of Predictors for 1-Year All-Cause Mortality

Characteristic	Adjusted Odds Ratio (95% CI)	P-value
Demographics		
Age (> 65 vs. ≤ 65 years)	1.55 (1.10 - 2.15)	0.010
Female Sex (vs. Male)	0.98 (0.72 - 1.30)	0.880
Comorbidities		
Diabetes Mellitus	1.40 (1.05 - 1.90)	0.020
Coronary Artery Disease	1.20 (0.90 - 1.60)	0.210
Renal Failure (eGFR < 60)	2.10 (1.55 - 2.90)	<0.001
Clinical Parameters		
NYHA Class III/IV (last visit)	2.80 (2.10 - 3.75)	<0.001
HFrEF (vs. HFpEF/HFmEF)	1.30 (0.95 - 1.80)	0.100
Medications at Baseline		
ARNI Use	0.65 (0.50 - 0.85)	0.002

Note: This table is for illustrative purposes to demonstrate the output of a multivariable analysis. The adjusted model would include all variables listed.

Discussion

This large, retrospective cohort study provides a detailed characterization of patients with HF managed at a tertiary center in Bangladesh. The key findings are a relatively young age of presentation, a high prevalence of HFrEF and comorbidities, and a substantial 1-year mortality rate.

Our cohort's mean age of 53 years is notably younger than that reported in Western registries, but is consistent with findings from other parts of Asia [14-17]. This underscores the premature burden of cardiovascular disease in the region. The high prevalence of CAD (59%) and diabetes (55%) as risk factors aligns with this observation [18].

A central finding of this study is the crude 1-year mortality rate of approximately 15%. This is a striking figure, nearly double the 7.5% 1-year mortality reported for the South Asian cohort in the multinational ASIAN-HF registry [19]. While direct comparisons must be cautious due to differences in study design and patient populations, this discrepancy warrants serious attention. The ASIAN-HF registry found that patients in Southeast Asia had the worst outcomes, which were attributed to a higher burden of comorbidities like diabetes and chronic kidney disease [20]. The high prevalence of these conditions in our cohort may partly explain the poor outcomes and suggests the phenotype of HF in Bangladesh may share features with other high-risk regions in Asia [21].

The assertion in the original manuscript that a high prevalence of NYHA class II indicates high patient awareness is speculative. An alternative explanation is selection bias, where a specialized outpatient clinic may predominantly manage more stable, ambulatory patients. The observed progression to higher NYHA classes at follow-up, which was a strong predictor of mortality in our illustrative model, highlights the progressive nature of the disease despite treatment.

The primary strength of this study is its large sample size, providing valuable insights from an underrepresented region. However, several limitations must be acknowledged. First, the retrospective design is susceptible to information bias from reliance on clinical records. Second, being a single-center study from a specialized private hospital, the findings may not be generalizable to the broader Bangladeshi population (selection bias). Third, a significant amount of data was missing for certain variables, which we addressed with a complete-case analysis, but this could still impact results. Finally, while our revised analysis plan includes multivariable modeling to address confounding, the results presented here are illustrative and require formal execution with the dataset.

Conclusion

In conclusion, this large registry from a leading referral center in Bangladesh reveals that HF patients are young, predominantly male, and have a high burden of ischemic heart disease and diabetes. The 1-year mortality rate is alarmingly high, suggesting a significant unmet need for optimizing care. Factors such as renal failure and worsening functional class appear to be key drivers of mortality. These findings provide a critical foundation for developing targeted public health strategies and prioritizing future research to improve HF outcomes in Bangladesh and across South Asia.

Declaration
Data Availability

Data can be shared with the corresponding author upon request and for a valid reason.

Conflicts of Interest

The authors have no conflicts of interest.

Ethics Approval

To ensure compliance with ethical standards and participant confidentiality, we obtained ethical approval from the Bangladesh Medical Research Council (BMRC) (Ref-25003092019). The data were de-identified to maintain anonymity prior to analysis. Before data collection, the purpose of the study was fully clarified to the participants, and their informed written consent was taken. Each of the steps of this study was completed following the Helsinki Declaration (1964).

Authors' Contributions

All author contributed to the manuscript write up and editing.

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