Original Article

Clinical profile, treatment patterns and one-year outcome of heart failure patients admitted in tertiary care hospital of North India

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Abstract

Introduction: Because of wide heterogeneity in the epidemiology of heart failure among different populations, it is imperative to establish population-specific databases. **Aims and Objectives:** To describe the clinical profile, treatment patterns, and outcomes of heart failure patients admitted to our tertiary care hospital. **Material and Methods:** The study was a prospective observational study conducted over two years at our tertiary care hospital. It included patients admitted with acute and acute-on-chronic heart failure. **Results:** We recruited 264 patients. Mean age of the study population was 57.8 ± 15.14 years. Males were 157 (59.5%). Dilated cardiomyopathy was the most common cause followed by ischemic heart disease. Most common risk factors were hypertension, tobacco use, anemia, and diabetes. Heart failure with reduced ejection fraction was present in 154 (62%) patients. Acute de novo heart failure was present in 91 (34.5%) patients. The most common precipitant for heart failure exacerbation was infection, followed by ischemic causes and non-adherence to drugs. The mean duration of hospital stay was 7.5 ± 3.1 days. The in-hospital mortality was 8.7%, and cumulative six-month and one-year mortality was 23% and 28%, respectively. In multivariate analysis, renal failure, readmission, and not being on guideline-directed medical treatment were significant predictors of mortality. **Conclusion:** Our patients were younger, predominantly males, with dilated and ischemic cardiomyopathy as commonest etiology. Hypertension and tobacco smoking were most common risk factors, with infections as most common precipitants. Only one-third of patients were on guideline-directed medical therapy. The one-year mortality was 28% and was higher in those without guideline-directed medical therapy.

Keywords: Heart failure, Kashmiri population, mortality, outcome, profile

Introduction

Heart Failure (CHF) is a debilitating condition that is frequently diagnosed in primary care settings. The long-term care of such patients is multifaceted, involving medical, psychosocial, and behavioural factors. There is an urgent requirement for using a collaborative team strategy to handle congestive heart failure (CHF) within primary healthcare settings. Primary care

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physicians are in a prime position to take the helm of these diverse teams, guaranteeing enhanced coordination, consistency, and excellence in healthcare delivery for patients dealing with long-term conditions across different environments and periods. HF is a clinical condition where individuals exhibit characteristic symptoms and signs because of an abnormality in the heart's structure, function, or both.[1] The burden of heart failure in primary care settings is substantial because it accounts for a significant portion of hospitalizations and healthcare costs, placing considerable strain on healthcare resources and patient outcomes. Recent trends indicate a rising incidence of heart failure cases managed by family care physicians, reflecting the aging population and increasing prevalence of risk factors such as hypertension, diabetes, and obesity. Although there is a lack of comprehensive global description regarding the epidemiology of HF, emerging data from diverse sources, such as population- and hospital-based studies,[2-4] indicate an increasing prevalence and severity of this syndrome. The rising prevalence of cardiovascular risk factors and diseases contributes to the growing incidence of HF. Approximately five million Americans aged ≥20 years are affected by HF, with projections indicating a 46% increase in HF prevalence in the United States from 2012 to 2030, leading to more than 8 million adults grappling with HF.[5] The lifetime risk of developing HF is estimated to be one in five or higher,[6] and the five-year mortality rate is comparable with that of numerous cancers.[7]

In India, the burden of HF is increasing, making it one of the largest populations of HF patients in the world. India is presently undergoing an epidemiological transition marked by a swift rise in the incidence of cardiovascular risk factors, cardiovascular disease, and HF,[8,9] with some researchers forecasting the overall burden of HF in India to close to 20 million.[10] Previous studies[11-15] have revealed wide heterogeneity in the epidemiology of HF among different populations. The variability observed in HF has made it imperative to establish population-specific databases. These databases aim to delineate the causes and risk factors of HF and understand presentation patterns, treatment approaches, and overall clinical outcomes across diverse ethnic and geographic groups. With this objective, we describe the clinical profile, treatment patterns, and outcomes of HF patients admitted to our tertiary care hospital in Srinagar, Jammu and Kashmir, India, over two years. By examining the clinical profile, prevalence of risk factors, treatment adherence, and outcomes among heart failure patients, this research seeks to identify key areas where primary care physicians can play a pivotal role in enhancing patient care and overall management strategies.

Materials and Methods

Study population

The study population consisted of patients with acute heart failure and acute-on-chronic heart failure admitted in our hospital. Acute heart failure was defined as a rapid onset or change in HF signs or symptoms, necessitating urgent therapy. This condition could result from acute de-novo HF or acute exacerbation of chronic HF.

Study design

The study was a prospective observational study conducted over a 2-year period at our tertiary care hospital. A total of 264 patients were enrolled from three departments: Emergency Medicine, Cardiology, and Internal Medicine. Written informed consent was obtained from each patient before their participation. The European Society of Cardiology (ESC) 2021 criteria[1] were followed for diagnosing HF. Diagnostic criteria included symptoms and signs of acute HF, supported by echocardiographic evidence of systolic or diastolic dysfunction. The patients were classified based on their ejection fraction into Heart failure with reduced ejection fraction (HFrEF) (EF < 40%), heart failure with preserved ejection fraction (HFpEF) (EF > 50%), and heart failure with mid-range ejection fraction (HFmrEF) (EF = 40–50%).

Inclusion and exclusion criteria

Patients who met the ESC 2016 criteria[1] for the diagnosis of acute heart failure with more than 18 years and provided informed consent were included. Those who declined to provide informed consent were excluded.

Data collection

Data collection encompassed demographics, clinical presentation, relevant investigations, medical therapy, and in-hospital mortality. Follow-up data included re-hospitalizations and mortality. Information on patients undergoing percutaneous or surgical intervention for heart ailments was also recorded. Follow-up visits were conducted at 6 and 12 months. The study complied with the principles outlined in the Declaration of Helsinki and was approved by the Institutional Review Board of the Institution (reference number of approval is SIMS 131/IEC-SKIMS/2019-344). Ethics committee approval was obtained. Date of approval is January 2021. All patients provided written informed consent. 'Guideline-based' medical treatment was defined as a combination of beta-blockers, angiotensin-converting enzyme inhibitors (ACEI) or angiotensin receptor blockers (ARB), and aldosterone receptor blockers in patients with left ventricular systolic dysfunction.[1]

Statistical methods

The recorded data were compiled and entered into a Microsoft Excel spreadsheet, then exported to SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA) for analysis. Continuous variables were expressed as Mean ± SD, whereas categorical variables were summarized as frequencies and percentages. Graphical representation used bar and line diagrams. Association of various parameters with mortality was assessed using the Chi-square test or Fisher's exact test, as appropriate. A P value < 0.05 was considered statistically significant, and all P values were two-tailed.

Results

Demographic and clinical characteristics

We recruited 264 patients within two years, from November 2018 to November 2020. The mean age of the study population was

57.8 ± 15.14 years. Males were 157 (59.5%) of the population. Two hundred (75.8%) patients were from rural areas. The mean BMI was 26.31 ± 3.53, with 134 patients (50.8%) having a BMI of 25-29 and 37 (14%) having a BMI of ≥30. Dilated cardiomyopathy (DCM) was the most common cause of heart failure [106 (40%)], followed by ischemic heart disease (IHD) [60 (22.7%)]. The most common risk factors were hypertension [157 (59.5%)], tobacco use [118 (44.7%)], anemia [63 (23.9%)], and diabetes mellitus {53 (20.1%0]. Heart failure with reduced EF (HFrEF) was present in 156 (63.41%) patients, with preserved EF (HFpEF) in 61 (24.79%) patients and heart failure with mid-range ejection fraction (HFmEF) in 29 (11.77%). Acute de-novo heart failure was present in 91 (34.5%) patients. The details are shown in Table 1. The most common precipitant for heart failure exacerbation was infection [170 (64.4%)], followed by ischemic causes[55 (20.8%)] and non-adherence to drugs [54 (20.5%)]. Other precipitants included anemia [34 (12.9%), arrythmias [26 (9.8%), non-adherence to fluid and salt restriction [16 (6.1%)], accelerated hypertension [17 (2.7%)], and drugs [5 (1.9%)].

Table 1: Clinical characteristics of study population

Variable	Total (*n*=264)
Age (years) mean (SD)	57.8 (15.14)
Males, *n* (%)	157 (59.5)
Rural residence, *n* (%)	200 (75.8)
Category of heart failure, *n* (%)	
Acute *de novo*	91 (34.5)
Acute on chronic	173 (65.53)
Aetiology, *n* (%)	
Dilated cardiomyopathy	106 (40.2)
Ischemic cardiomyopathy	60 (22.7)
Rheumatic heart disease	22 (8.3)
Hypertensive heart disease	16 (6.1)
Non-rheumatic valvular heart disease	15 (5.7)
Cor pulmonale	18 (6.8)
Congenital heart disease	8 (3)
Hypertrophic cardiomyopathy	8 (3)
Peripartum cardiomyopathy	6 (2.3)
Myopericarditis	3 (1.1)
Restrictive cardiomyopathy	1 (0.4)
Infective endocarditis	1 (0.4)
Risk factors, *n* (%)	
Hypertension	157 (59.5)
Tobacco use	118 (44.7)
Anaemia	63 (23.9)
Diabetes melitus	53 (20.1)
Hypothyroidism	34 (12.9)
Atrial arrhythmias	33 (12.5)
COPD	27 (10.2)
CKD	27 (10.2)
Prior stroke	5 (1.9)
Chemotherapy	5 (1.9)
Alcohol use	3 (1.1)
Hyperthyroidism	2 (0.8)
Heart failure type *n* (%)*	
EF <40%	156 (63.41)
EF =40-49%	29 (11.78)
EF ≥50%	61 (24.79)

COPD=Chronic obstructive pulmonary disease; CKD=Chronic kidney disease; EF=Ejection fraction; *Note 18 patients had isolated Cor pulmonale

Events during hospitalization and treatment details

The mean duration of hospital stay was 7.5 ± 3.1 days. The events during hospitalization included hypotension in 70 (26.5%), renal failure in 67 (25.4%), arrhythmias in 33 (12.5%), stroke in 5 (1.9%), and sepsis in 1 (0.4%) patients. During admission, almost all patients [255/264 (96.5%)] received diuretics, whereas 80 (30.3%) patients received beta blockers and 99 (37.5%) received either an ACE inhibitor or ARB or ARNI. Aldosterone blockers were prescribed to 82 (31.06%) patients. Twenty (9.46%) underwent percutaneous coronary interventions, and six (2.2%) underwent coronary artery bypass graft surgery. Medications at the time of hospital discharge include beta-blocker in 164 (61.4%), aldosterone antagonist in 102 (38.6%), ARNI in 49 (18.6%), ARB in 45 (17%), ACE I in 34 (12.9%), and diuretic in 23 (8.7%). Guideline-based medical treatment was given to only 52 (33.3%) of 156 patients with left ventricular systolic dysfunction at hospital discharge. The details of various medications and dosages are shown in Table 2. The target doses were achieved in only a minority of patients.

Readmission and mortality data

The in-hospital mortality was in 23 (8.7%) patients. At six months, a further 28 patients (12.7%) died, and at one year, an additional 11 patients (5%) died. Overall, 62 (28.1%) patients died at one-year follow-up. Sixty-six patients (29.9%) patients of the patients were readmitted after index hospitalization. However, 6-month and 12-month mortality and readmission rates were calculated after excluding those patients who were lost to follow-up (43 patients) as their outcome was unknown. In bivariate analysis, renal failure ($P < 0.001$), readmission ($P < 0.001$), and not being on guideline-directed medical therapy had a significant association with mortality [Tables 3 and 4]. In multivariate analysis, renal failure ($P = 0.042$), readmission ($P < 0.001$), and not being on guideline-directed medical treatment ($P = 0.006$) still had a significant association with mortality [Table 5].

Discussion

As highlighted in our research, heart failure presents unique challenges, and understanding the clinical features, treatment approaches, and prognostic indicators is crucial for primary care physicians to enhance patient care effectively. This study is the first study from our state about real-world data on heart failure patients. The salient features of our study are as follows: 1) Our study subjects were younger and predominantly male. 2) Dilated and ischemic cardiomyopathy were the most common causes of heart failure. 3) Hypertension and tobacco smoking were the most common risk factors, and infection and ischemic causes were the most common precipitants. 4) Only one-third of our study subjects on hospital discharge were on GDMT. 5) About

Table 2: Average dosage of various drugs

Medication (mg)	Mean	SD	MIN	MAX
Metoprolol	59.6	26.10	25	100
Bisoprolol	5	2.129	5	10
Carvedilol	11.5	5.69	6.25	20
Enalapril	7.5	2.89	5	10
Ramipril	2.5	1.12	2.5	2.5
Telmisartan	45.7	25.07	20	80
Spironolactone	30.6	11.02	25	50
Eplerenone	47.9	7.22	25	50
ARNI	119.0	91.37	50	400
Furosemide	40.0	5.66	40	40
Torsemide	10.1	2.12	5	20

ARNI: Angiotensin receptor blocker and neprilysin inhibitor

Table 3: Variables associated with mortality in study population

Parameter	Mortality [*n*=62]		No mortality [*n*=159]		*P*
	No.	Percentage	No.	Percentage	
Age (Years)					
<60	28	45.2	86	54.1	
≥60	34	54.8	73	45.9	0.232
Gender					
Male	37	59.7	94	59.1	
Female	25	40.3	65	40.9	0.939
Residence					
Rural	48	77.4	121	76.1	
Urban	14	22.6	38	23.9	0.836
BMI					
<25	25	40.3	56	35.2	
≥25	37	59.7	103	64.8	0.479
Hypertension					
Yes	34	54.8	96	60.4	
No	28	45.2	63	39.6	0.452
Anemia					
Yes	12	19.4	37	23.3	
No	50	80.6	122	76.7	0.529
Creatinine					
<1.5	30	48.4	117	73.6	
≥1.5	32	51.6	42	26.4	<0.001
Hypotension					
Yes	14	22.6	44	27.7	
No	48	77.4	115	72.3	0.439
Re-admission					
Yes	45	72.6	21	13.2	
No	17	27.4	138	86.8	<0.001

BMI: Body mass index

30% of the patients were readmitted after index hospitalization. In-hospital mortality was 8.7%, and cumulative six months and one-year mortality was 23% and 28%, respectively. Mortality was significantly associated with renal failure, readmissions, and not being on evidence-based treatment. Our findings are crucial for primary care physicians, as they offer significant insights into heart failure patients' clinical features, treatment approaches, and prognostic indicators in a specific population. By applying evidence-based guidelines, controlling modifiable risk factors, and adjusting treatment plans in light of these insights, primary care physicians can significantly enhance the quality and outcomes of care for heart failure patients. The findings from our study underscore the critical role of primary care providers, particularly family physicians, in managing heart failure patients.

The mean age of our population was 57.8 (SD 15.14) years, affecting most productive life years. It was comparable with the national average of 59.9 (SD 13.5) years.[15] However, our patients were younger by a decade compared with Western[16,17] and other international studies.[18] This could be accounted for by the recent studies showing an increased incidence of heart failure risk factors and acute coronary syndromes at a younger age in the Indian population.[19,20] Moreover, the age distribution of our study patients was different, with less than 8 percent constituting >85 years of age, which is much lower than other international registries.[21,22] Males constituted 59.5% of the study population, less than that reported in National Heart Failure Registry (NHFR)[15] (70% males). The relatively higher female preponderance compared with NHFR may be because the most common etiology of HF in our population was DCM as opposed to ischemic (more common in males) in NHFR.

Hypertension was the most common (59.5%) risk factor, followed by tobacco use (44.7%), anemia (24%) and diabetes mellitus (20%). It was consistent with other studies.[23,24] The high prevalence of these risk factors in our study population is a matter of concern and warrants primordial, primary, and secondary prevention efforts. The high prevalence of risk factors identified in our study, particularly hypertension, tobacco use, and diabetes mellitus, underscores the importance of primary and secondary prevention efforts led by family physicians. These efforts may include lifestyle modifications, medication management, patient education, and regular monitoring to control risk factors and prevent heart failure exacerbations.

Most patients had HfrEF (61.9%), whereas HfpEF constituted 25%. It was consistent with other Indian studies.[25] The proportion of HfpEF varies by 33–50% in the major international registries.[16,21] The lower incidence of HFPEF in our populations compared with the West can be explained by the fact that in the West, risk factors for CAD such as DM, tobacco consumption, and hypertension have been aggressively addressed, resulting in decreased incidence of HfrEF.

We found that DCM was the most common cause of heart failure, constituting 40% of the study population, followed by IHD, which included 23% of the study population. However, data from NHFR[15] and THFR[25] show IHD to be the most common etiology in Indians. In our DCM patients, 20% did not undergo CAG, and their etiology is uncertain. However, DCM, IHD, and hypertensive heart disease were the most common etiologies of heart failure amongst the study patients, which is comparable with other data.[15,25] Around 8% of the study population had RHD as their cause of heart failure, which is higher than the national average of 6%.[15] Therefore, rigorous efforts are needed for the primary prevention of RHD. Primary care physicians can play

Table 4: Correlation of evidence-based treatment with mortality in patients with reduced ejection fraction

Evidence based treatment	Mortality		No mortality		*P*
	No.	Percentage	No.	Percentage	
Present	4	9.5	48	42.1	
Absent	38	90.5	66	57.9	0.0003
Total	42	100	114	100	

Table 5: Multivariate analysis showing independent predictors of mortality in study population

Variable	Odds ratio	95% CI	*P*
Re-admission	6.2	3.71-9.43	<0.001
Creatinine ≥1.5	1.9	1.24-3.71	0.042
Evidence-based treatment absent	3.4	1.96-6.52	0.006

a pivot role in primary prevention of RHD through education, regular screening, and monitoring high-risk patients for disease progression. This in turn can help in reducing the burden of RHD and heart failure.

The most common precipitant was infection (64%), followed by ischemic causes (21%) and non-adherence to drugs (20%). In Kashmir, India, subzero temperatures are common during winters that predispose patients to respiratory tract infections. Efforts to decrease respiratory tract infections and educate the patients vis-a-vis evidence-based treatment and dietary restrictions are required to improve outcomes and reduce readmission, considering infection and non-adherence as one of the commonest precipitants. Moreover, promoting healthy lifestyles to decrease ACS and optimizing ACS treatment will significantly impact reducing heart failure incidence.

Our study demonstrated that the in-hospital mortality was 8.7%, and cumulative six-month and one-year mortality was 23% and 28%, respectively. The in-hospital and one-year mortality rates were comparable with the Trivandrum Heart failure Registry[25] (8.6% and 30.8%, respectively) and to the Framingham Heart Failure Study (20- 30% one-year mortality).[26] The high mortality at one year warrants aggressive interventions. Interventions that are required range from primordial, primary, and secondary prevention to optimizing the treatment of those with end-stage disease and developing novel therapies. Considering the grim prognosis of heart failure patients reported by our study and many other studies, it becomes imperative to develop strategies to mitigate this problem.

Prognostic research serves as a valuable tool for categorizing patients into distinct risk groups, aligning the intensity of interventions with the level of risk for effective disease management. Although risk models such as the Global Registry of Acute Coronary Events (GRACE) score have demonstrated efficacy in predicting heart failure (HF) admissions among Europeans, these models lack validation in the Indian population. We found renal failure, rehospitalizations, and non-receipt of guideline-based HF medical treatment were linked to inferior outcomes in our patients. Serum creatinine has consistently emerged as an independent predictor of mortality across various registries.[11,16,17] Notably, only a third of the study population receives guideline-based medical treatment, underscoring a potential opportunity to enhance HF care in Kashmir. Our study highlights the suboptimal use of evidence-based medications among our HF patients, emphasizing the need to develop and implement quality improvement programs to enhance evidence-based HF management in this region. Family care physicians can improve medication adherence by educating them about medication importance and side effects, simplifying regimens, monitoring adherence during follow-ups, addressing barriers such as cost concerns, involving caregivers, and using technology for communication and monitoring.

Limitations

This was a hospital-based single-center study with a small sample size. However, data from our local population is scarce, and it provides us with valuable data. The etiological profile of the patients was not complete, as twenty percent did not undergo CAG. However, dilated and ischemic cardiomyopathy were undoubtedly the two leading causes, which is consistent with other national and international data. The study was conducted when COVID-19 struck the world, which affected the admission/readmission of patients. Many study patients were followed telephonically, and forty-three patients were lost to follow-up because of the prevailing pandemic.

Conclusions

Our patients were younger, predominantly males, with DCM as the commonest etiology. Hypertension and tobacco smoking were the most common risk factors, with infections as the most common precipitants. Only one-third of patients were on GDMT. The one-year mortality was twenty-eight percent and was more in those without GDMT. We emphasize the need to develop and implement quality improvement programs to enhance GDMT for HF management in this region.

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Conflicts of interest

There are no conflicts of interest.

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