

Etiological spectrum of Heart Failure in a tertiary health care facility of Central Nepal

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Abstract

Background and Aims: High-income countries have reported common causes of heart failure as ischaemic heart diseases, hypertension, valvular heart diseases, and cardiomyopathies. There are limited data available about epidemiology of heart failure in low-income countries like Nepal. The main objective of this study is to explore etiological spectrum of heart failure in Nepal.

Methods: This cross-sectional study was conducted at the cardiology department of Kathmandu Medical College from April 15, 2019, to July 15, 2019. Data were collected from patients diagnosed as heart failure following the European Society of Cardiology criteria and having left ventricular ejection fraction less than 50% and classified into Heart failure with mid-range or reduced ejection fraction. Diastolic heart failure, Cor-pulmonale, and stroke were excluded. The data were entered and analyzed in Statistical Package for Social Sciences 20.0 using descriptive and inferential statistics.

Results: Among 132 heart failure patients (mean age: 63.9±13.9 years), around two-thirds (65.2%) had heart failure with reduced ejection fraction (ejection fraction of less than 40%) and one third (34.8%) had heart failure with mid-range ejection fraction (40 to 49%). Dilated cardiomyopathy was the leading cause of heart failure among nearly half (47.7%) of study participants, followed by valvular heart disease (19.7%), hypertensive heart disease (14.4%) and ischaemic heart disease (13.6%). Almost half of the study participants with dilated cardiomyopathy had severe left ventricular systolic dysfunction. (p<0.05).

Conclusion: Dilated cardiomyopathy was the most prevalent cause of heart failure, followed by valvular heart disease in our study.

Keywords: Dilated Cardiomyopathy, Etiology, Heart Failure.

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Introduction

Heart Failure (HF) is emerging as a global epidemic with the prevalence of 1-2% in the adult population, rising to ≥10% after the age of more than 70 years¹. One year mortality rates for hospitalized and ambulatory HF patients are 17% and 7%, and hospitalization rates are 44% and 32%, respectively². It leads to high economic burden³, which has greater impact in low and middle-

income countries (LMICs) due to limited resources to manage such conditions⁴.

Heart failure can be classified as having reduced, mid-range, and preserved ejection fraction¹. Common etiologies are ischemic cardiomyopathy, hypertensive heart disease, idiopathic cardiomyopathy and valvular heart disease in high-income countries⁵. Nepal has high burden of rheumatic heart disease, with

prevalence in central Nepal as 0.9 per 1000⁶. However, after including borderline and definite rheumatic heart disease in Eastern Nepal, the prevalence increases to 10.2 per 1000⁷. Non-communicable disease risk factors like hypertension is also in increasing trend⁸, with the current prevalence of 26%⁹. Furthermore, low awareness^{10, 11}, low adherence to medication¹² and inadequate human resources, limited healthcare infrastructure, and health disparities lead to inflation of the health challenge¹³.

There are few studies on sociodemographic, etiologic patterns of heart failure conducted in Nepal which showed the diverse findings. Therefore, this study aims to explore the etiological spectrum of heart failure in the tertiary level of health care of Nepal which will be valuable in better understanding the etiology for prevention and management of heart failure.

Methods

This prospective cross-sectional study was carried out at cardiology department of Kathmandu Medical College Teaching Hospital (KMCTH) for the duration of three months, from April 15, 2019, to July 15, 2019. A total of 132 participants were enrolled in the study. Patients with diastolic heart failure, cor-pulmonale, stroke, and chronic kidney disease were excluded from the study. Data were collected from the HF patients, age 18 years and above, visiting cardiology Out-patient department of KMCTH and patients admitted to cardiology ward, after completion of initial investigations and echocardiogram. The final diagnosis was made by echocardiogram with left ventricular ejection fraction less than 50%. Informed written consent was taken, and the confidentiality of participants was maintained. The HF was diagnosed according to the European Society of Cardiology criteria¹, namely, symptoms of HF with or without signs, with objective evidence of systolic dysfunction by echocardiography. Based on European Society of Cardiology criteria, heart failure was categorized into Heart failure with mid-range ejection fraction (HFmrEF) that includes LVEF 40 to 49% and Heart failure with reduced ejection fraction (HFrEF) which includes LVEF less than 40%¹. Left ventricular systolic function was also classified as per American society of echocardiography into mild (LVEF>40%), moderate (LVEF 30-40%) and severely abnormal (LVEF<30%)¹⁴.

Ischaemic heart disease (IHD) was considered as etiology of heart failure in a patient with a documented history of myocardial infarction, unstable angina or stable angina with left ventricular dysfunction, ejection fraction (LVEF<50%). Rheumatic heart disease (RHD), was considered as a cause of HF if symptoms could be explained by lesion severity with left ventricular dysfunction, (LVEF<50%). Hypertension was considered as a cause of HF, if there was left ventricular dysfunction, ejection fraction LVEF<50% with hypertension and concentric hypertrophy. Dilated cardiomyopathy was considered the primary etiology if left ventricular systolic dysfunction was present in the absence of IHD, RHD, hypertension, and other possible causes. Congenital heart disease was considered the etiology of HF if shunt or obstructive lesion causing LV dysfunction (LVEF<50%). Asia Pacific scale was used to classify the body mass index¹⁵. Ethical clearance was taken from the Institutional Review Committee of KMCTH (reference no.150420191). Data were entered and analyzed in Statistical Package for Social Sciences (SPSS) Version 20.0 using the descriptive and inferential statistics.

Results

Among the total (132) study population, 54.5% (72) were female, and 45.5% (60) were male, and two-thirds were of the age group of more than 60 years with mean age of 63.9±13.9 years. Similarly, two-thirds of the participants were obese (with body mass index ≥ 25).

Approximately one-third (32.6%) of them had hypertension, and 12.9% of them had diabetes mellitus, which is illustrated in detail in Table 1.

Table 1: Sociodemographic Characteristics of Study Population (N=132)

Sociodemographic Characteristics	Categories	Number (Percentage)
Age (years)	<40	9 (6.8)
	41-50	10 (7.6)
	51-60	28 (21.2)
	61-70	39 (29.5)
	>70	46 (34.8)
Gender	Male	60 (45.5)
	Female	72 (54.5)
Body Mass Index (kg/m ²)	<18.5	8 (6.1)
	18.5-22.9	16 (12.1)
	23-24.9	24 (18.2)
	≥25	84 (63.6)
History of Hypertension	Yes	43 (32.6)
	No	89 (67.4)
History of Diabetes Mellitus	Yes	17 (12.9)
	No	115 (87.1)
History of Smoking	Current Smoker	25 (18.9)
	Ex-Smoker	39 (29.5)
	Non-Smoker	68 (51.5)
History of Alcohol Consumption	Yes	30 (22.7)
	No	102 (77.3)

Majority of patients presented with shortness of breath (66.7%) followed by palpitation (31.8%) and swelling of lower limbs (13.6%). The mean hemoglobin concentration among the study population was 11.62 ±1.17mg/dl. Around two-thirds (65.2%) of participants had heart failure with reduced ejection fraction and remaining one third (34.8%) of patients had heart failure with mid-range ejection fraction (Table 2). Further analysis demonstrated that one-third of the study population had severe systolic dysfunction.

Regarding the cause of heart failure, dilated cardiomyopathy was the leading cause of heart failure in our study population accounting for nearly half (47.7%) of the study population followed by valvular heart disease 19.7%, and ischaemic heart disease in 13.6%. Peripartum cardiomyopathy was found among 1.5% of participants. There was one case each of mitral valve prolapse, hypertrophic cardiomyopathy and constrictive pericarditis. Among the valvular heart disease, the degenerative valvular disease was present in 12.8% and rheumatic heart disease in 6% as demonstrated in Table 2.

Comparison of the different variables with the severity of heart failure based LVEF is illustrated in Table 3. Nearly half of the study population had moderately abnormal LVEF. Similarly, nearly half of

the study population with dilated cardiomyopathy had severely impaired LVEF ($p < 0.05$).

Table 2: Spectrum of Heart Failure (N=132)

Clinical Spectrum		Number (Percentage)
Major Presenting Complaints*	Shortness of Breath	88 (66.7)
	Palpitation	42 (31.8)
	Fatigue	20 (15.2)
	Swelling of Limbs	18 (13.6)
	Others	21 (15.9)
Electrocardiogram (ECG) finding*	Left Bundle Branch Block	32 (24.2)
	Atrial Fibrillation	27 (20.5)
	Sinus Tachycardia	18 (13.6)
	Left Axis Deviation	15 (11.4)
	Q-wave	12 (9.1)
	Left Ventricular Hypertrophy	9 (6.8)
	Others	29 (22.0)
Heart Failure Classification	Heart failure with mid-range ejection fraction	46 (34.8)
	Heart failure with reduced ejection fraction	86 (65.2)
Left-Ventricular Ejection Fraction	Mild dysfunction (>40 to 49%)	23 (17.4)
	Moderate dysfunction (30-40%)	65 (49.2)
	Severe dysfunction (<30%)	44 (33.3)
Etiology of Heart Failure	Dilated Cardiomyopathy	63 (47.7)
	Valvular Heart Disease	26 (19.7)
	Degenerative	17 (12.8)
	Rheumatic	8 (6.0)
	Mitral Valve Prolapse	1 (0.8)
	Hypertensive Heart Disease	19 (14.4)
	Ischaemic Heart Disease	18 (13.6)
	Atrial Septal Defect	2(4.6)
	Peripartum Cardiomyopathy	2(1.5)
	Hypertrophic Cardiomyopathy	1(0.8)
	Constrictive Pericarditis	1 (0.8)

*Multiple entries were done for presenting complaints/ECG findings, a single patient presenting with multiple complaints/ECG findings.

Table 3: Comparison of Variables with Left Ventricular Ejection Fraction

Left ventricular ejection fraction (in Percentage)	Mildly Abnormal (41 to 49)	Moderately Abnormal (30 to 40)	Severely Abnormal (<30)	Total	P-value
Variables					
Gender					
Male	8 (13.3)	30 (50.0)	22 (36.7)	60 (100.0)	
Female	15 (20.8)	35 (48.6)	22 (30.6)	72 (100.0)	
Total	23 (17.4)	65 (49.2)	44 (33.3)	132 (100.0)	0.488
Age group(years)					
<40	3 (33.3)	2 (22.2)	4 (44.4)	9 (100.0)	
41-50	4 (40.0)	4 (40.0)	2 (20.0)	10 (100.0)	
51-60	5 (17.9)	14 (50.0)	9 (32.1)	28 (100.0)	
61-70	6 (15.4)	21 (53.8)	12 (30.8)	39 (100.0)	
>70	5 (10.9)	24 (52.2)	17 (37.0)	46 (100.0)	
Total	23 (17.4)	65 (49.2)	44 (33.3)	132 (100.0)	0.399
Body Mass Index(kg/m2)					
<18.5	4 (50.0)	4 (50.0)	0 (0.0)	8 (100.0)	0.100
18.5-22.9	3 (18.8)	5 (31.2)	8 (50.0)	16 (100.0)	
23-24.9	3 (12.5)	13 (54.2)	8 (33.3)	24 (100.0)	
>25	13 (15.5)	43(51.2)	28 (33.3)	84 (100.0)	
Total	23 (17.4)	65 (49.2)	44 (33.3)	132 (100.0)	
Etiology of Heart Failure					
Dilated cardiomyopathy	4 (6.3)	27 (42.9)	32 (50.8)	63 (100.0)	
Valvular heart diseases	7 (26.9)	17 (65.4)	2 (7.7)	26 (100.0)	
Hypertensive heart disease	9 (47.4)	8 (42.1)	2 (10.5)	19 (100.0)	
Ischaemic heart diseases	1 (5.6)	12 (66.7)	5 (27.8)	18 (100.0)	
Others	2 (33.3)	1 (16.7)	3 (50.0)	6 (100.0)	
Total	23 (17.4)	65 (49.2)	44 (33.3)	132 (100.0)	0.000

Discussion

The global prevalence of HF is 1-2%¹, with a higher prevalence among East Asian countries ranging from 1.3 to 6.7%¹⁶. The present prospective cross-sectional study has demonstrated the etiological spectrum of patients presenting with heart failure in a tertiary level of health care setting of Nepal. Among the study population, two-thirds of participants were of more than 60 years of age with a mean age of 63.9±13.9 years. A previous hospital-based study of the Eastern part of Nepal showed the mean age of HF as 53.5 years, which was lower than our study findings¹⁷. Similarly, study conducted in Pakistan and Bangladesh showed the mean age of participants with HF as 54 years and 54.1 years, respectively^{18, 19}. In contrast, the prevalence of HF is increasing in age group of above 70 years in high-income countries²⁰. As the lifetime risk of HF increases with age, the burden of HF is likely to rise with the growing age of the population in South Asia⁴.

In terms of etiology of HF, one of the study reported that ischaemic heart disease has increased and valvular heart disease has decreased in the East Asia Region¹⁶. However, in our study, dilated cardiomyopathy was the significant cause of heart failure contributing for nearly half (47.7%) the patients, followed by valvular heart disease among 19.7% of cases. Ischemic heart disease accounted for 13.6% of cases. The previous study from the Western part of Nepal

had reported the causes of HF as ischemic (29.5%), hypertensive (24.6%), dilated cardiomyopathy (21.6%), Cor-pulmonale (15.5%) and valvular heart disease (8.7%)²¹. However, Cor-pulmonale patients were excluded from our study. In contrast, a study from Central part of Nepal conducted at emergency department among the HF patients diagnosed by Framingham criteria, reported the commonest cause as rheumatic heart disease (25.1%), followed by dilated cardiomyopathy (22.8%), and coronary artery disease (18.1%)²². However, in our study outpatient and admitted patients were included and HF was diagnosed by European Society of Cardiology criteria.

Ischemic heart disease was the major cause of heart failure (35.7%), and dilated cardiomyopathy was present in 12.2% of cases in Bangladesh¹⁹. Another hospital-based study conducted in India reported rheumatic heart disease (52%) as the most common cause of heart failure followed by ischemic heart disease (17%), hypertensive heart disease (9.8%), dilated cardiomyopathy (9.8%) and congenital heart disease (5.8%)²³. However, the study from Pakistan among recent-onset systolic HF with LVEF <40% reported that 77% had ischemic heart disease²⁴. In contrast to our finding, USA National registry reported that patients with HF had a relatively higher proportion of ischemic etiology which was 52.6%, 71.1% and 72.9% for those aged <65, 65-76 and >76 years respectively²⁵.

A study from high-income countries showed the heart failure was associated with comorbid conditions like hypertension, ischaemic heart diseases, and diabetes mellitus²⁰. Corresponding with that, our study population had hypertension and diabetes mellitus 32.6% and 12.9% respectively. A similar trend was observed in a study from Eastern Nepal with hypertension in 26.6% and diabetes in 18.7%¹⁷. However, the prevalence of a history of hypertension and diabetes in HF were found as 54.2% and 14.8% respectively in the study of Western Nepal²¹. Similarly, study of Bangladesh found the prevalence of hypertension and diabetes mellitus in 49.4% and 18.8% respectively¹⁹. One of the reviews from South East Asian countries reported the prevalence of coronary artery disease in 25% to 47% among HF patients. The prevalence of hypertension in HF was 23% to 47% in China. Moreover, HF due to valvular disease was reported in 15% - 35% in most countries, but only 4% in Malaysia¹⁶. Additionally, heart failure was also associated with obesity in almost two-thirds of the study population.

In our study one-third of the study population had severe systolic dysfunction and around half of the patient had moderate systolic dysfunction, resulting in a total of nearly 83% being HF with moderate to severe reduction of ejection fraction. In the study from Pakistan, 55% of patients were having severe heart failure¹⁸. There were relatively few uncommon causes such as peripartum cardiomyopathy (1.5%) and one (0.8%) each of mitral valve prolapse, hypertrophic cardiomyopathy and constrictive pericarditis in our study. The observed patterns of disease were similar to the study from India with peripartum cardiomyopathy, mitral valve prolapse, and constrictive pericarditis contributing as 1.9%, 2.8%, and 1.9% respectively⁴.

Conclusion

Dilated cardiomyopathy was the most frequent etiology of heart failure in our study, followed by valvular heart disease. Hypertensive heart disease and ischaemic heart disease were the next common causes. However, it is difficult to confirm the temporal relationship of the causal factors due to the cross-sectional nature of the study. Therefore, further analytical case-control and prospective cohort studies should be conducted to confirm the etiological factors of heart failure better. Nevertheless, our study could be helpful for better understanding and timely management of the etiology of heart failure in the context of Nepal and other similar LMICs settings.

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Conflict of Interest: None

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