

## A STUDY ON CLINICAL AND AETIOLOGICAL PROFILE OF HEART FAILURE AT KBN TEACHING AND GENERAL HOSPITAL

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### ABSTRACT

#### BACKGROUND

The heart failure is a worldwide health problem with ever increasing proportion and is a major health problem in elderly persons. It has many aetiological factors. It is one of the most frequently encountered illnesses in day-to-day practice and most common cause of death in patients with cardiac disease. This study was done to determine the age and sex distribution and to evaluate clinical features and aetiological factors in patients admitted with heart failure at Khaja Banda Nawaz Teaching and General Hospital, Gulbarga, on the basis of clinical assessment, electrocardiography and echocardiography.

#### MATERIALS AND METHODS

A prospective study was done in Department of General Medicine at Khaja Banda Nawaz Teaching and General Hospital, Gulbarga, from January 2015 to June 2016 on patients with heart failure to determine the clinical and aetiological profile. A total of 100 cases above the age of 20 years were included in the study. The patients below the age of 20 years and known cases of congenital heart disease were excluded.

#### RESULTS

Out of 100 patients, the heart failure was seen more commonly in men than in women between the age groups of 46-65 years of age. Breathlessness was the most common presentation followed by pedal oedema, orthopnoea, etc. In our study, the primary aetiology for heart failure was found to be coronary artery disease (47%) followed by dilated cardiomyopathy (20%), hypertension (14%), rheumatic heart disease (7%), anaemia (6%), cor pulmonale (4%) and others (2%). Dyslipidaemia was the common risk factor followed by obesity and smoking.

#### CONCLUSION

The heart failure commonly occurs in elderly people and the incidence was higher in men than in women. The commonest presentation was breathlessness followed by pedal oedema. The commonest cause of heart failure was coronary artery disease followed by dilated cardiomyopathy and then hypertension combined with ischaemic heart disease.

#### KEYWORDS

Heart Failure, Coronary Artery Disease, Dilated Cardiomyopathy, Hypertension, Rheumatic Heart Disease, Cor Pulmonale, Anaemia.

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#### BACKGROUND

Heart Failure (HF) is a common cardiovascular condition with increasing incidence and prevalence.<sup>1</sup> It is a worldwide health problem predominantly seen in elderly persons. Unlike western countries where heart failure is predominantly a disease of elderly; in India, it also affects younger age group.<sup>2</sup> The prevalence and aetiology of heart failure has been previously incompletely described in Indian population due to absence of surveillance programmes to track incidence, prevalence, causes, etc.<sup>3</sup>

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ACC/AHA defines as "heart failure is a complex clinical syndrome that can result from any structural or functional cardiac disorder that impairs ventricle filling with or ejection of blood. The cardinal manifestations of heart failure are dyspnoea and fatigue, which may limit exercise tolerance and fluid retention, which may lead to pulmonary congestion and/or splanchnic congestion and peripheral oedema."<sup>4</sup>

As per the data available, estimation of prevalence of heart failure in India due to coronary artery disease, hypertension, obesity, diabetes and rheumatic heart disease ranges from 1.3 to 4.6 million with an annual incidence of 0.49-1.8 million.<sup>3</sup> Around 5.7 million people in the United States have heart failure. It is the most rapidly growing cardiovascular problem and a major cause of death, taking nearly 55,000 lives every year. Nearly, 5.7 million patients in the US have heart failure with 1.1 million hospitalisations. Heart failure is the most common Medicare discharge diagnosis and costly cardiac problem in US.<sup>5</sup>



It accounts for 34.4 billion dollars in costs in 2008 and more than 55,000 deaths occurred due to heart failure in 2008. In Framingham heart study, a cohort of 5,209 subjects has been assessed biennially since 1948 with further cohort added in 1971.<sup>6</sup> The data has been used to determine the incidence and prevalence of heart failure defined with consistent clinical and radiographic criteria. In India, we do not have data regarding the exact prevalence and incidence of heart failure.<sup>2</sup> Several British studies on epidemiology of heart failure and left ventricular dysfunction have been conducted, one such study on incidence of heart failure was done in west London district-Hillingdon heart failure study.<sup>7</sup>

The incidence of heart failure increases with increasing age and the prevalence approximately doubles with each decade of ageing. As the frequency of the risk factors increases with increasing age, the incidence of HF also increases. The risk of HF incidence increases with old age.<sup>6</sup> The incidence of HF and survival after diagnosis were investigated in a population-based cohort study of the population of Olmsted County, Minnesota, in the United States. HF mortality, however, has declined overtime with a 5-year mortality rate of 57% in 1979 to 1984, 48% in 1996 to 2000.<sup>8</sup> Extrapolating from the published literature, McMurray and Colleagues<sup>9</sup> estimated that 23 million individuals worldwide have HF.

## MATERIALS AND METHODS

A study on clinical and aetiological profile of heart failure was done on patients of above 20 years of age who were admitted in K.B.N. Teaching and General Hospital during the period of January 2015 to June 2016. All the classical cases of heart failure above the age of 20 years according to Framingham criteria with right-sided or left-sided heart failure independently or in combination (biventricular failure) were included. Patients below the age of 20 years and already diagnosed cases of congenital heart disease were excluded from this study. Diagnosis of heart failure was confirmed by Framingham Criteria (Table No. 1) and 2-D Echocardiography. Clinical presentation and aetiology of the patients of heart failure was analysed.

## RESULTS

This study comprised of 100 heart failure patients with mean age of 50.2 years. Out of 100 patients, 59% were males and 41% were females. The male-to-female ratio was 1.4:1. The heart failure was most common in the age group 46-65 years both in males and females (Table No. 2). The first most common aetiology for heart failure was found to be coronary artery disease (47%) followed by dilated cardiomyopathy (20%), hypertension (14%), rheumatic heart disease (7%), anaemia (6%), cor pulmonale (4%) and others (2%) (Table No. 3). The common clinical features patients presented to the department were as follows, breathlessness (90%), pedal oedema (56%), tachycardia (60%), S3 gallop (35%), raised jugular venous pressure (40%), pulmonary oedema (30%), hepatomegaly (25%), pleural effusion (20%) and ascites (14%) (Table No. 4).

Out of 47 patients with coronary artery disease, 28 [59.6%] patients were males and 19 [40.4%] patients were females. It was common in the age group 46-65 years [68.1%] in both males and females (Table No. 5). The common risk factor was dyslipidaemia (80.9%) followed by obesity (74.5%), smoking (53.2%), hypertension (51.1%), and diabetes (42.6%). Out of 20 patients of dilated cardiomyopathy, 13 [65%] were male and 7 [35%] were female. It was common in the age group 46-65 years [60%], the most common aetiology was found to be ischaemic heart disease (70%) (Table No. 5). The 14 [14%] patients with heart failure were presented with hypertension in that 9 [64.3%] were male and 5 [35.7%] were female [Table No. 6].

According to JNC VII classification of blood pressure, 12 [85.7%] patients were in stage 2 and 2 [14.3] patients were in stage 1 hypertension. 8 [57.1%] patients had the history of diabetes mellitus and 6 [42.9%] had past history of hypertension. 5 [35.7%] patients had grade I and 2 [14.3%] patients had grade II hypertensive retinopathy. 2D echo showed left ventricular hypertrophy in all 14 patients in whom 12 [85.7%] patients had diastolic dysfunction. The chest x-ray showed cardiomegaly in all the patients. The 7 [7%] patients who presented with heart failure had rheumatic heart disease as a causative factor [Table No. 7] in that 2 [28.6%] patients were male and 5 [71.4%] patients were female. The 2 [28.6%] patients had pure mitral stenosis, 2 [28.6%] patients had mitral stenosis with mitral regurgitation, 1 [14.2%] patient had aortic stenosis with aortic regurgitation and 2 [28.6%] patients had multivalvular heart disease. 2 patients were in atrial fibrillation. The chest x-ray showed cardiomegaly and 2D echo showed respective valvular disease with pulmonary hypertension. The 6 [6%] patients had anaemia as a causative factor for heart failure, in that 4 [66.7%] were females and 2 [33.3%] were males [Table No. 7]. The average haemoglobin percentage was 3-4 g/dL in 5 [83.3%] patients and 5 g/dL in 1 patient [16.7%]. The haemogram showed microcytic hypochromic anaemia in 3 [50%] patients, macrocytic anaemia in 1 [16.7%] patient and dimorphic anaemia in 2 [33.3%] patients. The last common cause presented with heart failure was cor pulmonale (4%) [Table No. 6]. The most common cause for cor pulmonale was found to be COPD (75%). The ECG showed peaked P waves with RSR pattern in chest leads in all the patients. 2D echo showed enlargement of right atrium and right ventricle of the heart. The other cause for heart failure was chronic renal failure (2 patients).

Major Criteria	Minor Criteria
Paroxysmal Nocturnal Dyspnoea	Bilateral Ankle Oedema
Neck Vein Distention	Nocturnal Cough
Rales	Dyspnoea on Ordinary Exertion
Radiographic Cardiomegaly (Increasing Heart Size on Chest Radiography)	Hepatomegaly
Acute Pulmonary Oedema	Pleural Effusion
S3 Gallop	
Increased Central Venous Pressure [ $>16$ cm H <sub>2</sub> O at Right Atrium]	Decrease in Vital Capacity by One Third from Maximum Recorded
Hepatojugular reflux	Tachycardia [Heart rate $>120$ beats/min.]
Weight Loss $>4.5$ kg in 5 days in Response to Treatment	

**Table 1. Framingham Criteria for Congestive Heart Failure**

Diagnosis of CHF requires the simultaneous presence of at least 2 major or 1MAJOR in conjunction with 2 minor criteria. Minor criteria are acceptable only if they cannot be attributed to another medical condition [such as pulmonary hypertension, chronic lung disease, cirrhosis, ascites or the nephrotic syndrome]. These criteria are 100% sensitive and 78% specific for identifying persons with definite congestive heart failure.

Sl. No.	Age Group	Total	Male	Percentage (%)	Female	Percentage (%)
1.	18-25	6	3	5.1%	3	7.3%
2.	26-35	8	5	8.5%	3	7.3%
3.	36-45	12	7	11.9%	5	12.2%
4.	46-55	29	16	27.1%	13	31.7%
5.	56-65	28	16	27.1%	12	29.2%
6.	66-75	13	9	15.3%	4	9.8%
7.	$>75$	4	3	5.1%	1	2.4%
	<b>Total</b>	<b>100</b>	<b>59</b>	<b>59%</b>	<b>41</b>	<b>41%</b>

**Table 2. Age and Sex Distribution of Male and Female**

Aetiology	No. of Cases	Percentage (%)
Coronary Artery Disease	47	47%
Dilated Cardiomyopathy	20	20%
Hypertension	14	14%
Rheumatic Heart Disease	7	7%
Anaemia	6	6%
Cor Pulmonale	4	4%
Others	2	2%
<b>Total</b>	<b>100</b>	<b>100%</b>

**Table 3. Causes of Heart Failure**

Common Clinical Features	No. of Patients	Percentage (%)
Breathlessness	90	90%
Pedal Oedema	56	56%
Ascites	14	14%
Tachycardia	60	60%
S3 Gallop	35	35%
Jugular Venous Pressure	40	40%
Pulmonary Oedema	30	30%
Hepatomegaly	25	25%
Pleural Effusion	20	20%

**Table 4. Distribution of Clinical Features of Heart Failure**

Sl. No.	Age Group (Years)	CAD				DCM			
		Cases	Percentage (%)	Male	Female	Cases	Percentage (%)	Male	Female
1.	18-25					2	10%	1	1
2.	26-35	1	2.1%	1	0	2	10%	1	1
3.	36-45	4	8.5%	3	1	2	10%	2	0
4.	46-55	17	36.2%	9	8	7	35%	4	3
5.	56-65	15	31.9%	8	7	5	25%	4	1
6.	66-75	7	14.9%	5	2	2	10%	1	1
7.	$>75$	3	6.4%	2	1	-	-	-	-
		<b>47</b>	<b>100%</b>	<b>28</b> (59.6%)	<b>19</b> (40.4%)	<b>20</b>	<b>100%</b>	<b>13</b> (65%)	<b>7</b> (35%)

**Table 5. Age and Sex Distribution of CAD and DCM Causing Heart Failure (HF)**

Sl. No.	Age Group	Hypertension				Cor Pulmonale			
		Cases	Percentage (%)	Male %	Female %	Cases	Percentage (%)	Male %	Female %
1.	26-35	1	7.1%	1	0	0	0%	0	0
2.	36-45	2	14.3%	1	1	0	0%	--	--
3.	46-55	4	28.6%	3	1	0	0%	--	--
4.	56-65	5	35.7%	3	2	2	50%	1	1
5.	66-75	2	14.3%	1	1	2	50%	2	--
	<b>Total</b>	<b>14</b>	<b>100%</b>	<b>9 (64.3%)</b>	<b>5 (35.7%)</b>	<b>4</b>	<b>100%</b>	<b>3 (75%)</b>	<b>1 (25%)</b>

**Table 6. Age and Sex Incidence of HTN and Cor Pulmonale Causing Heart Failure**

Sl. No.	Age Group (years)	RHD				Anaemia			
		Cases	Percentage (%)	Male %	Female %	Cases	%	Male	Female
1.	18-25	3	42.9%	1	2	1	16.7%	0	1
2.	26-35	1	14.3%	1	0	1	16.7%	0	1
3.	36-45	2	28.6%	0	2	2	33.3%	1	1
4.	46-55	1	14.3%	0	1	1	16.7%	1	0
5.	56-65					1	16.7%	0	1
	<b>Total</b>	<b>7</b>	<b>100%</b>	<b>2 (28.6%)</b>	<b>5 (71.4%)</b>	<b>6</b>	<b>100%</b>	<b>2 (33.3%)</b>	<b>4 (66.7%)</b>

**Table 7. Age and Sex Incidence of RHD and Anaemia Causing Heart Failure**

**DISCUSSION**

Heart failure is a major worldwide health problem. It has various clinical presentation and many causative factors. It develops when the cardiac output is insufficient to meet metabolic demands of the body. The fundamental defect is decrease in myocardial contractility resulting in decrease in stroke volume and cardiac output. It consists of unique constellation of symptoms and signs that arise from congested organs and hypoperfusion of tissues. Karl Swedberg, Joh Cleland et al<sup>10</sup> in their guidelines for the diagnosis and treatment of chronic heart failure stated the clinical profile, which included breathlessness, ankle swelling, fatigue, peripheral oedema, raised JVP, hepatomegaly and the characteristic signs of congestion of systemic veins. The incidence of heart failure increases with age. It is commonly seen among the age groups 46 to 65 years. Recent studies indicate that ischaemic heart disease is the commonest cause of heart failure. Dilated cardiomyopathy is a patent contributor and is the second common cause of heart failure.

In the present study, most commonly affected age group was 46 to 65 years and percentage of affected males [59%] were high compared to females [41%]. Male gender, old age, physical inactivity, overweight, diabetes mellitus, hypertension, valvular heart disease and coronary heart disease are consistently reported as being associated with risk of developing heart failure.<sup>11,12</sup> The coronary artery disease was the most common causative factor for heart failure contributing 47% with incidence of 59.6% in men and 40.4% in women similar to the studies of Hamzullah Khan et al<sup>13</sup> and Docherala et al.<sup>14</sup>

It was more common among 46 to 65 years of age group [68.1%] with male-to-female ratio 1.5:1. Cowie MR<sup>5</sup> and McKee PA, Castelli WP et al<sup>15</sup> in their study confirmed coronary artery disease is a major contributing cause of heart failure. Dyslipidaemia [38%] was the most common associated factor followed by obesity [35%], smoking [25%], hypertension [24%], diabetes mellitus [20%] and family history [15%] of coronary artery disease. In coronary artery disease, atherosclerosis was found to be the most common risk factor.<sup>12,16</sup> Coronary risk factors such as smoking and diabetes mellitus are also associated factor for development of heart failure. Body weight and a high ratio of total cholesterol concentration to high density lipoprotein cholesterol concentration are also independent-associated factor for heart failure. ECG and 2D echocardiography was done for all the patients. ECG showed myocardial infarction in 57.4% of patients and myocardial ischaemia in 42.6% of patients. Chest x-ray showed cardiomegaly in 22 [46.8%] patients and pulmonary oedema in [17.0%]. 2D echocardiography showed regional wall motion abnormality of involved myocardium in 95.7% of patients and less ejection fraction in 95.7% of patients [ $<30\%$  in 4,  $30-40\%$  in 12,  $40-50\%$  in 26 and  $>50\%$  in 2 patients].

Dilated Cardiomyopathy [DCM] is also a common cause of heart failure in which the predominant abnormality is dilatation of the left ventricle with or without right ventricular dilatation. In our study, DCM was the second leading cause of heart failure constituting 20% of cases similar to Khan MA et al.<sup>17</sup> The common age group affected in our study was 46 to 65 years. The male-to-female ratio was similar to other studies.

The main aetiology was ischaemic heart disease contributing 70% of patients. The ECG showed LBBB pattern in 6 [30%] patients and atrial fibrillation in 2 [10%] patients. 2D echo showed dilated cardiac chambers in all the patients with less ejection fraction [ $<30\%$  in 12 (60%), 30-40% in 6 (30%) and 40-45% in 2 (10%) patients]. Hypertension is also a one of the cause for heart failure. It predisposes to heart failure via a number of pathological mechanisms including left ventricular hypertrophy. Levy D, Larson MG et al<sup>18</sup> in their study on hypertension confirmed that there is increased risk of heart failure in patients with hypertension. In the Framingham heart study, hypertension was reported as the cause of heart failure either alone or in association with other factors. In our study, hypertension was the third common cause contributing 14% of total cases. The 85.7% of patients were in stage II hypertension and 50% of them had hypertensive retinopathy. ECG showed Left Ventricular Hypertrophy [LVH] in 85.7% of patients. 2D echo showed LVH in all the patients and 71.4% had diastolic dysfunction.

Rheumatic Heart Disease [RHD] may have declined in certain parts of the world, but it still represents an important cause of heart failure in India and the other developing nations according to Docheralam M et al.<sup>14</sup> In our study, RHD [7%] was the fourth leading cause of heart failure, which was more common in age groups between 16 to 25 years with male-to-female ratio about 1:2.5. The mitral valve involvement accounts to 57.1%, aortic valve involvement accounts to 14.3% and combined to 28.6%. Heart failure due to RHD was seen in 15% by Roy, 45% by Vaishnav et al, 1.9% by Sanyal and 20% by Shaw studies. A variety of observational studies have found lower Hb% or haematocrit to be associated with adverse clinical outcomes in heart failure. This relationship persists whether considering Hb% concentration as a continuous variable or anaemia as a categorical variable. Anaemia has been shown to be a risk factor for new cardiovascular events in the general population.<sup>19</sup> Data from the Framingham study found that lower haematocrit was a significant risk factor for the development of symptomatic heart failure.<sup>20</sup> In our study, anaemia was the fifth leading cause of heart failure accounting for 7% of cases. The females were more commonly affected and microcytic hypochromic anaemia was more common. 2D echo showed mild dilated cardiac chambers with ejection fraction almost normal in all the patients.

Cor pulmonale is the right ventricular enlargement and eventually failure secondary to a lung disorder that causes pulmonary artery hypertension. In cor pulmonale, in response to increase in pulmonary vascular resistance, the right ventricle gradually undergoes hypertrophy and dilatation. This increases the end-diastolic volume, i.e. preload. This accounts for the reduced right ventricular ejection fraction.<sup>21</sup> However, in severe emphysema, the low elastic recoil of the lungs and negative intrathoracic pressure has the effect of compressing the two ventricles into each other.<sup>22</sup> The right ventricle is therefore unable to dilate and end-diastolic volume does not increase.

This decreases the right ventricular preload and results in lower cardiac output.<sup>23</sup> Changes in right ventricular output invariable alter left ventricular preload. The increased right ventricular end-diastolic volume in cor pulmonale induces a shift of the interventricular septum into left ventricle and decreases left ventricular diastolic compliance, but this does not adversely affect left ventricular output. This tends to preserve left ventricular ejection fraction in emphysematous patients in severe right ventricular hypertrophy.<sup>24</sup> In our study, cor pulmonale was another cause that caused heart failure affecting males [75%] more commonly. All male patients had smoking history. COPD was the most common aetiology [75%]. ECG showed peaked p waves and RSR pattern in chest leads. 2D echo showed dilated right atrium and right ventricle with mild-to-moderate tricuspid regurgitation. The ejection fraction was 40-50% in all the cases. Renal insufficiency predicts the occurrence of new cases of heart failure<sup>25,26</sup> showing a graded increase in risk with increasing levels of serum creatinine. Even mild insufficiency is associated with a progression of asymptomatic left ventricular systolic dysfunction to overt heart failure. In our study, 2 patients of chronic kidney disease presented with heart failure whose serum creatinine level was between 4 to 6 mg/dL.

## CONCLUSIONS

The heart failure is a most commonly encountered problem having different aetiologies. Clinical assessment and investigations are essential for diagnosis of heart failure. The common age group for heart failure was between 46 to 65 years of age and the incidence was higher in men than in women. The common presentation was breathlessness, followed by pedal oedema. The commonest cause of heart failure was coronary artery disease followed by dilated cardiomyopathy and hypertension. The other causes are rheumatic heart disease, anaemia, cor pulmonale and chronic renal failure. 2D echocardiography is the most commonly used investigation for diagnosis and assessment of prognosis of heart failure. It is useful in ischaemic heart disease for showing regional wall motion abnormality and ejection fraction. It is also helpful in assessing the severity of valvular lesions. Recent advances in cardiology have made the early recognition of cause for heart failure easier. The modern drug treatment and interventions have the potential to improve symptoms and quality of life.

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