

## Original Research Article

# Clinical analysis of cardiac failure in post-myocardial infarction patients

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## ABSTRACT

**Background:** Cardiac failure is one of the common complications of Acute Myocardial Infarction. As CAD is the leading cause of death and post MI Cardiac failure also causing increase in rate of Mortality. It directs us to assess the complications of MI and to evaluate the precautionary & preventive steps of cardiac failure.

**Methods:** The present study comprises of 50 cardiac failure patients with history of MI in the past and who presented with myocardial infarction with cardiac failure were included in this study. We excluded the patients who presented with Cardiac failure without Prior history of MI. This hospital based cross sectional study was conducted at Rajiv Gandhi Institute of Medical Sciences (RIMS), Ongole, Prakasam District, Andhra Pradesh. The study was carried out for a period of 1 year with informed consent.

**Results:** In present study majority number of patients (33) show hypokinesia and 10 are found to have dyskinesia and only 4 are akinesia. In this study More than 50% patients are with history of anterior wall involvement. 36(72%) patients have elevated JVP, 34(68%) have cardiomegaly, 38 patients presented with PND. 29(58%) patients are DM and 35(70%) are HTN and only 6(12%) patients are neither DM, nor HTN.

**Conclusions:** Cardiac failure is a common complication after MI. Most common presentations are breathlessness, chest pain, PND, JVP etc. Anterior wall MI on ECG either isolated or associated with other walls is the leading cause of post MI cardiac failure.

**Keywords:** Cardiac failure, Post Myocardial Infarction, Signs and symptoms

## INTRODUCTION

Cardiac failure (heart failure) is a clinical syndrome that may result from any structural or functional cardiac disorder that impairs the pumping ability of the heart. Post infarction cardiac failure is one of the common complications of Acute Myocardial Infarction, which is influenced by many factors like extent of MI, life style, associated co morbid conditions. It is clinically observed when the contractile dysfunction exceeds more than 25% of left ventricular free wall muscle mass, it is considered

as significant. Cardiac output is function of preload, afterload and myocardial contractility.<sup>1</sup>

If the compensatory mechanisms are not able to cope up the cardiac function, the increased Left Ventricular End Diastolic Volume (LVEDV) will lead to increased myocardial wall tension and increased myocardial oxygen demand, which further increases Left Ventricular End Diastolic Pressure and leads to pulmonary congestion and ultimately leads to Right Heart Failure. Scarring of the Inferior Wall of the Left Ventricle often

involves the postero medial papillary muscle, which gives rise to mitral regurgitation. If mechanical complications are associated in Acute Myocardial Infarction such as papillary muscle dysfunction, mitral regurgitation, ventricular septal rupture etc., will further increase the myocardial wall tension and oxygen demand which finally leads to pulmonary congestion.

Commonest mechanisms of post infarct cardiac failure:

- Contractile dysfunction (Systolic dysfunction)
- Diastolic dysfunction
- Right ventricular dysfunction
- Acute mitral regurgitation
- Ventricular septal defect
- Cardiac free wall rupture

At the same time these complications also depend on some other risk factors like male gender, older age, physical inactivity, overweight, diabetes mellitus, hypertension, associated valvular heart diseases, cigarette smoking and coronary heart diseases etc.

The risk of sudden death is highest in the first 30 days after MI among patients with LV dysfunction, heart failure or both. Thus, earlier implementation of strategies for preventing sudden death may be warranted in selected cases. The post myocardial infarct cardiac failure clinically present as diffuse spectrum, usually presented with dyspnoea, basal crepitations due to pulmonary congestion. If the condition is much more worsens peripheral edema with central cyanosis can be seen.

#### ***New York hear association classification of Dyspnoea***

NYHA Classification is commonly used to categorize the severity of Heart failure.

- CLASS-I: No symptoms with ordinary activity
- CLASS-II: Mild limitation of physical activity
- Symptoms with ordinary physical activity
- CLASS-III: Marked limitation of physical activity
- Symptoms with less than ordinary physical activity
- CLASS-IV: Symptoms with any physical activity or even at rest.

Patients with associated chronic kidney disease (CKD) were at greater risk for the composite end point [MI, Fatal Coronary Heart Disease] than patients without CKD (30.1% Vs 13.2%). The researchers concluded that Patients with CKD should be considered as high risk for CVD and mortality outcomes and are candidates for aggressive risk factor reduction.<sup>2</sup>

Paradoxically, major advances in the treatment of Acute Myocardial Infarction have led to an increasing burden of heart failure, due to patients surviving the acute cardiac insult and then living with a significantly damaged heart.<sup>3</sup> But administration of reperfusion therapy within 24 hours

after MI was associated with lower risk of Post-MI heart failure and accounted for most of the temporary decline in heart failure.<sup>4</sup>

## **METHODS**

As Heart failure after MI is one of the major complication and burden now a day. So, it is necessary to assess the complications of MI and take necessary precautionary steps to delay the onset of cardiac failure, if possible to prevent future and other complications.

If the patient is already presents with cardiac failure steps to improve his general condition and delay progression by non-pharmacological methods like life style modifications and by pharmacological methods.

A cross sectional hospital-based study was performed at the Rajiv Gandhi Institute of Medical Sciences (RIMS), Ongole, Prakasam District, Andhra Pradesh for a period of 1 year between NOV 2016-OCT 2017.

The present study comprises of 50 cardiac failure patients with history of MI in the past and who presented with myocardial infarction with cardiac failure were included in this study. 50 cases of post myocardial infarction with failure were selected who attended medical and cardiology OPD and admitted in medicine and cardiology wards during this period.

Detailed medical history, general, physical and systemic examinations were noted. Along with above criteria Life style, Waist Hip Ratio (WHR), BMI and Number of episodes also noted. We noted all these details in the form of case sheet with prior informed consent from each patient.

#### ***Inclusion Criteria***

- Patients with history of Myocardial Infarction at least one attack including present attack with heart failure are included.
- Patients with other systemic diseases like Diabetes Mellitus, Hypertension, COPD, CRF etc., are also included in this study.

#### ***Exclusion Criteria***

- Patients with heart failure due to other than Myocardial Infarction were excluded.
- Patients older than 70 years were excluded.
- Patients with a clinical history of heart failure prior to the index MI were excluded.

#### ***Investigations***

CBC, RFT, LFT, RBS, BNP (B Type Natriuretic peptide), Urine routine, Lipid Profile, ECG, Chest X-Ray, 2D ECHO, TMT and Colour Doppler if required.

## RESULTS

We did this study from Nov 2016 to Oct 2017 among 50 patients with history of MI. 2D Echo cardiogram/Doppler is the most useful noninvasive cardiac imaging for diagnosis, evaluation and management of Heart failure. RWMA is one of the most important indicators of prior MI, which causes LV failure. In this study majority number of patients show hypokinesia 33 (66%) and 10 (20%) have dyskinesia and only 4 (8%) are akinesia. We evaluated the RWMA findings of 2D ECHO in the following heads.

### Functional Abnormality

SD-Systolic Dysfunction, DD-Diastolic Dysfunction  
CD-Combined Dysfunction, GD Global Dysfunction  
RVD- Right Ventricular Dysfunction

### Chamber Enlargement

LAE-Left Atrial Enlargement, LVH- Left Ventricular Hypertrophy, RAE- Right Atrial Enlargement  
RVH- Right Ventricular Hypertrophy

Functional abnormality is the feature of Heart failure. It may be either systolic or diastolic. In this study 31 (62%) patients have systolic dysfunction while 11 (22%) have diastolic dysfunction and the remaining 8 (16%) have global, combined dysfunction. Morphological change is the feature of cardiac failure.

It may be enlargement/ hypertrophy. Here 18 patients have LVH, 16 (32%) patients have LAE and 10 (20%) patients have combined LVH+LAE. Surprisingly 2 (4%) patients didn't have any change (Table No.1).

**Table 1: Distribution According to 2D ECHO Finding in Post MI Cardiac Failure in the study group.**

Functional Abnormality	CD	DD	GD	RVD	SD	Total
Number	4	11	3	1	31	50
%	8	22	6	2	62	100
Chamber Enlargement	LAE	LAE+ LVH	LVH	NO	RAE	RVH
Number	16	10	18	1	2	2
%	32	20	36	2	4	4
RWMA	A	C	D	H	N	Total
Number	4	1	10	33	2	50
%	8	2	20	66	4	100

**Table 2: Distribution according to ECG Changes in Post MI Wall.**

MI Wall	Number	%
AI	8	16
AS	17	34
Ext – A	10	20
Inf	10	20
Lat	2	4
NQ	2	4
RV	1	2
Total	50	100

In this study 17 (34%) patients have H/O antero septal MI, 10 (20%) patients are with history of extensive anterior wall MI, 8 (16%) patients are with antero inferior MI history. The remaining patients are with inferior wall 10 (20%), lateral wall 2 (4%) etc. This study shows most of the patients are with history of anterior wall 35 (70%) involvement (Table 2). In this present study 36 (72%) patients have elevated JVP/Pedal edema, 34 (68%) have cardiomegaly, 38 (76%) patients presented with PND. So, at around 70% patients presented with signs and symptoms of Heart Failure (Table 3).

Breathlessness is one of the chief complaints patients presented. NYHA classification is very important prognostic criteria of Heart failure described based on breathlessness.

**Table 3: Analysis of clinical manifestations in post-MI cardiac failure.**

	JVP/ Edema		Cardiomegaly		PND/ Orthopnea	
	No.	%	No.	%	No.	%
Present/ Elevated	36	72	34	68	38	76
Absent/ Normal	14	28	16	32	12	24
Total	50	100	50	100	50	100

In present study 4 (8%) patients belong to NYHA class-I. class- II includes 14 (28%) patients.

Breathlessness on daily routine and at rest i.e., NYHA-III and IV class include 17 (34%) and 15 (30%) patients respectively. Older age group and smokers presented with class III and class IV (Table 4).

**Table 4: Breathlessness according to (NYHA-New York Heart Association).**

Age	I	%	II	%	III	%	IV	%
21-30	1	2	0	0	0	0	0	0
31-40	1	2	2	4	1	2	0	0
41-50	1	2	6	12	4	8	2	4
51-60	1	2	4	8	6	12	4	8
61-70	0	0	2	4	6	12	9	18
Total	4	8	14	28	17	34	15	30

**Table 5: Distribution according to Co-morbid conditions in the study group.**

Co-morbid	Status				
Conditions	Yes	%	No	%	Total
DM	29	58	21	42	50
HTN	35	70	15	30	50
Others	28	56	22	44	50

In this study 29 (58%) patients are DM and 35 (70%) are HTN and only 6 (12%) patients are neither DM, nor HTN. But share some of the risk factors like COPD. Little number of patients is pulmonary tuberculosis, Bronchial Asthma and, CRF (5 patients) (Table No.5).

## DISCUSSION

Heart failure arises as a consequence of an abnormality in cardiac structure, function, rhythm or conduction. Coronary Heart Disease is the most common cause of heart failure. In the Studies of Left Ventricular Dysfunction (SOLVD) Coronary artery disease accounts for almost 75% of the cases of chronic heart failure in males, although in Framingham heart study, Coronary Heart Disease accounted for only 46% of cases of heart failure in men and 27% of chronic heart failure cases in women.<sup>5</sup> The diagnosis rests on history, clinical evaluation, 2D echo, M mode echo studies and confirmed by colour Doppler and right heart catheterization with a flow directed balloon tipped catheter demonstration.<sup>6</sup> Acute ischemia of the left ventricle sometimes causes diastolic dysfunction and acute elevation of left atrial pressure and even causes pulmonary edema. But x- ray chest and ejection fraction are normal during this episode and this condition is called Stiff Heart Syndrome.<sup>7</sup>

In 1970, Burch and colleagues first used the term "Ischemic cardiomyopathy" to describe the condition in which CAD results in severe myocardial dysfunction with clinical manifestation often indistinguishable from those of primary dilated cardiomyopathy. It is important to recognize hibernating myocardium in patients with ischemic cardiomyopathy.<sup>8</sup> It has been noted that if the electrocardiogram is completely normal then heart failure due to left ventricular systolic dysfunction is unlikely.<sup>9</sup> The plasma concentration of B type natriuretic peptide may be even more useful, in that heart failure (due to any

cause) is unlikely if this blood test result is normal. Both these tests may, therefore be helpful in the differential diagnosis of patients presenting with dyspnoea or effort intolerance. If either test is (or both tests are) abnormal further cardiac investigations are likely to prove worthwhile.<sup>10</sup> Apart from managing heart failure, it is also very important to treat other associated co- morbid conditions like anemia, renal failure, DM etc. Even mild renal disease, as assessed by the estimated GFR, should be considered a major risk factor for cardiovascular complications after a myocardial infarction.<sup>11</sup>

## CONCLUSION

Cardiac failure is a common complication after MI. The common clinical features at presentation are exertional breathlessness, anginal chest pain, PND, elevated JVP etc. Anterior wall MI on ECG either isolated (20%) or associated with other walls (50%) is the leading cause of post MI cardiac failure. RWMA on 2D ECHO are common after MI which include Akinesia (81%), Hypokinesia (66%). In this study a significant number of patients, nearly 35 patients have chief complaints of Angina (either rest or exertion). In 18 patients 2D ECHO showed mitral regurgitation (mild or moderate), which is one of the important complications of MI. Patients with DM (58%), HTN (70%), and others (including COPD, PT, CRF, etc.) (56%) increase the risk of post MI cardiac failure.

The most important presentation is breathlessness, nearly all patients have breathlessness with varying grade. Patients have also presented with PND/Orthopnea (76%). The most common signs seen are elevated JVP/Edema (72%), radiographic cardiomegaly (65%). Systolic dysfunction (62%) is a more common cause than any other functional abnormality in cause of post MI cardiac failure. Anterior wall MI, either isolated (20%) or

associated with other walls (50%), leading cause of post MI cardiac failure.

We recommend that patients presenting with signs & symptoms of Heart failure are to be evaluated for prior H/O MI, if information is not available advised to do ECG, BNP, 2D ECHO, CXR to rule out H/O MI for best management.

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