

## Factors Predicting Mortality In Indian Patients Hospitalized For Acute Decompensated Heart Failure

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### BACKGROUND

To identify predictors of in-hospital mortality in Indian subset of patients hospitalized for ADHF and to assess various epidemiological, clinical and investigational characteristics of patients in relation to their hospital survival or non-survival. Analysis was done to estimate the characteristics that predict in-hospital mortality and to compare those mortality predictors with those of western studies.

### METHOD

It is a prospective study carried out in CoimbatoreMedicalCollegeHospital from May 2016 – July 2016. A total of 100 patients who were hospitalized for ADHF were selected for the study

### RESULTS

Acute decompensated heart failure is common across all age groups though more frequent in 50 – 70 years age group. Poor NYHA grades are strongly associated with increased in-hospital mortality rate. Approximately three fourth of admissions is for new onset (first time) ADHF. Lower ejection fractions and hemoglobin level are correlated with higher hospital death rate. Maximum deaths occur in the initial five days of admission. The in-hospital mortality rate of our study is 11%.

### CONCLUSION

Due to the changing pattern of risk factors, the incidence and prevalence of heart failure are on the rise especially in India. Large-scale Indian studies are needed so that management strategy and guidelines specific for Indian ADHF patients especially in resource restrained settings can be devised.

**KEYWORDS :** HEART FAILURE, MYOCARDIAL INFARCTION, ADHF

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## IN. INTRODUCTION

The estimates of prevalence and annual incidence of heart failure in India in the year 2000 are 1.3 - 4.6 million and 0.4 – 1.8 million respectively. The actual values will certainly be higher as these estimates have not taken into account uncommon causes of heart failure<sup>1</sup>. The risk factors of industrialization such as hypertension, coronary artery disease adding up to the conventional ones that are still contributing to heart failure in India such as rheumatic heart disease may probably contribute to this higher prevalence<sup>1</sup>. Heart failure is essentially a disease of old age the proportion of which is increasing in India due to the growing age of its population consequent to the latest advancements in medical field<sup>3,4</sup>. Though chronic heart failure has been the subject of interest among researchers for a long time, studies have lately started focusing on the entity of ADHF in view of the requirement for frequent hospitalisation, the associated morbidity and mortality, and the resultant burden on healthcare expenditure<sup>11-15</sup>. There are sporadic reports that have studied the aetiology of congestive cardiac failure and precipitating factors of ADHF in Indian patients admitted in Indian hospitals<sup>18,19</sup>. The aim of this study is to identify predictors of in-hospital mortality in Indian subset of patients hospitalized for ADHF.

### Methods

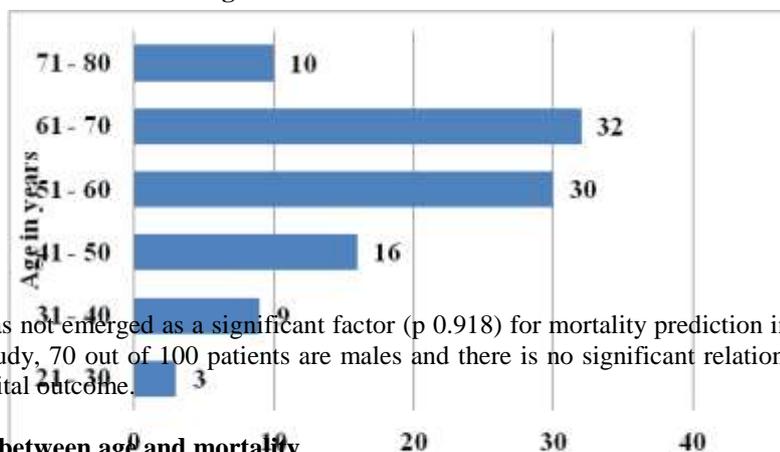
It is a prospective study carried out in CoimbatoreMedicalCollegeHospital from May 2016 – July 2016. A total of 100 patients who were hospitalized for ADHF were selected for the study. Eligible patients will be enrolled in the study after obtaining informed signed written consent to participate in the same. The principal investigator collects baseline characteristic details of, elicits medical and medications history from and performs complete physical examination in all patients. . All patients were put under continued follow-up during their

entire hospital stay until study endpoint [discharge after clinical improvement (or) death]. The variables and the in-hospital outcome [discharge after clinical improvement (or) death] were recorded in a confidential database which in turn were subjected to correlation and statistical analysis at the end of the study.

**RESULTS**

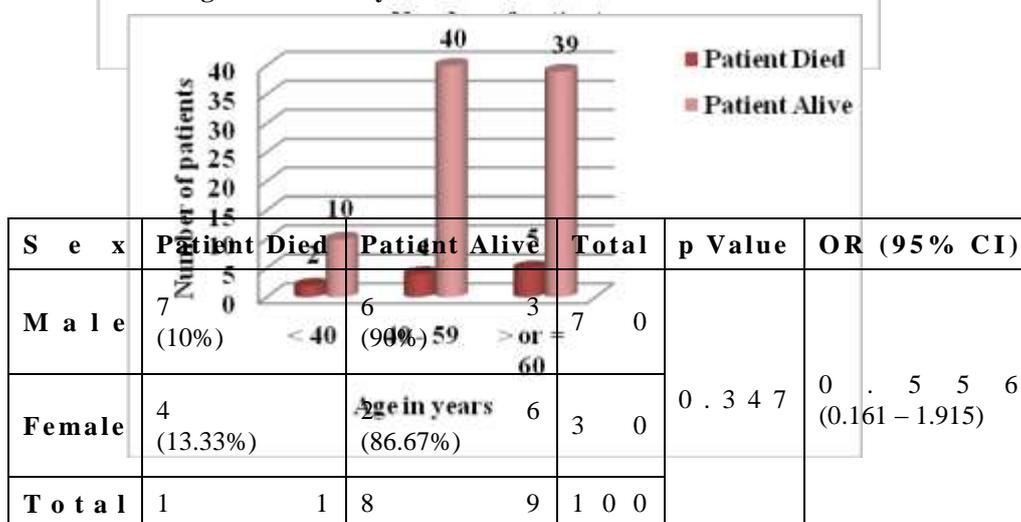
In our study of 100 patients, a maximum of thirty two patients fall in the 61-70 years age window and it is closely followed by 71-80 years age category that includes thirty patients. The number of patients abruptly drops down to ten in the category of 41-50 years age. The least number of patients is naturally in the 20-30 years category (three in number).

**Fig : 1 Relation between age and ADHF**



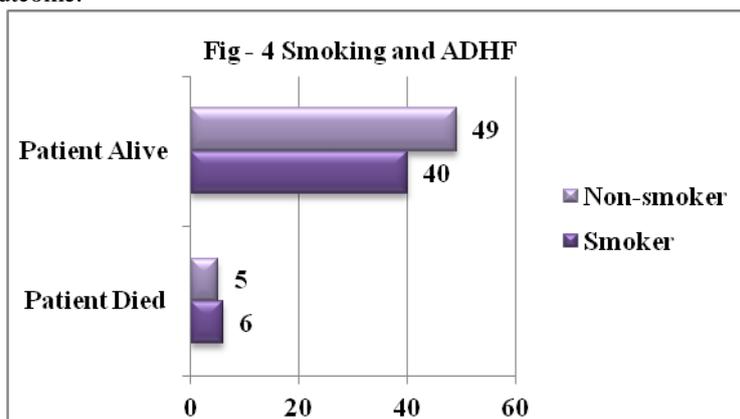
Age has not emerged as a significant factor (p 0.918) for mortality prediction in ADHF patients of our study. In our study, 70 out of 100 patients are males and there is no significant relationship (p 0.347) between sex and in-hospital outcome.

**Fig-2 Relation between age and mortality**



**Fig-3 Relation to sex**

In our study, 70 out of 100 patients are males and there is no significant relationship (p 0.347) between sex and in-hospital outcome.



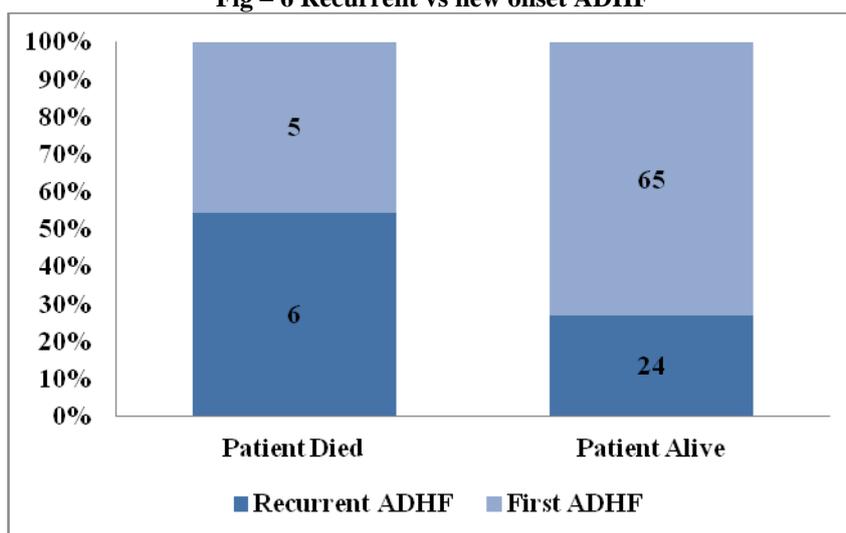
Nearly half of our patients were smokers. Though smoking is an important risk factor for heart failure, it has not emerged significant (p 0.179) for predicting in-hospital mortality in our study.

**Fig 5 – NYHA GRADING AND ADHF**

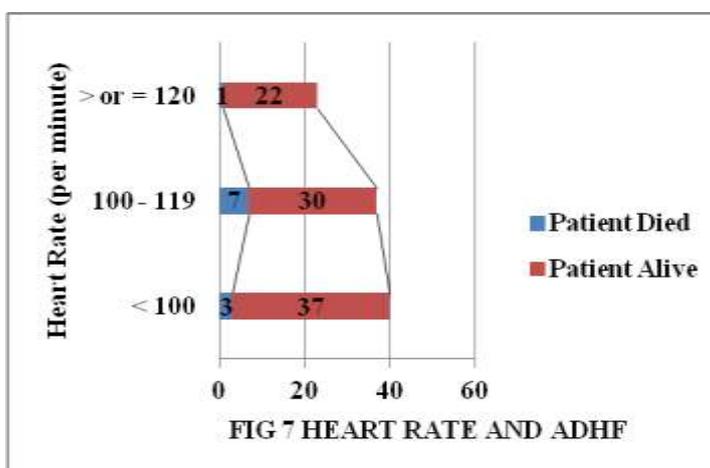
NYHA	Patient Died	Patient Alive	Total	p Value	OR (95% CI)
Grade 4	9 (18%)	4 (82%)	5	0.014	6.000 (1.242 – 28.987)
Grade 3	2 (4%)	4 (96%)	5		
Total	1	8	9		

The NYHA grade among our patients on admission fall into either grade 3 or 4. Exactly half of them presented with either grade. The proportion of grade 4 patients (81.8%) is markedly higher than that of grade 3 patients (18.2%) in the dead category. On statistical comparison also, the NYHA grading factor has turned out to be a significant predictor (p 0.014) of in-hospital mortality.

**Fig – 6 Recurrent vs new onset ADHF**



Nearly three fourth of the admissions were new onset where there was no previous history of admission for ADHF. However, it is not a significant risk factor (p 0.107) for in-hospital death in our study.



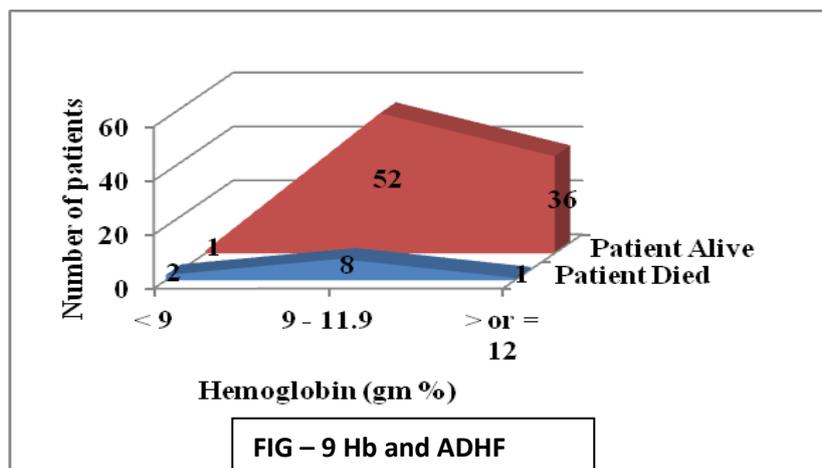
The admission heart rate is not an indicator of in-hospital mortality in our study (p 0.36), though heart rate of less than 120 appears to be associated with better survival rate.

**FIG - 8 : Ejection fraction versus in-hospital mortality**

Ejection Fraction (%)	Patient Died	Patient Alive	Total	p Value	OR (95% CI)
< 30	1 (14.28%)	6 (85.72%)	7	0.004	21.78 (2.657 - 178.58)
30 - 50	8 (12.7%)	5 (87.3%)	13		
> 50	2 (6.67%)	2 (93.33%)	4		
<b>T o t a l</b>	<b>11</b>	<b>13</b>	<b>24</b>		

Severity of systolic dysfunction (low ejection fraction) is strongly associated (p 0.004) with death of our patients in hospital. The mortality rate increases from 6.7% when the EF is more than 50% to 12.7% when the EF is between 30% and 50% to 14.3% when the EF is less than 30%. Majority of our patients (63%) have had moderate LV dysfunction.

Hemoglobin level on admission has shown a strong association (p 0.01) with the hospital outcome in our study. The mortality rates are 2.7%, 13.3% and 66.7% against the hemoglobin levels of > or = 12 gm%, 9 – 11.9 gm% and < 9 gm% respectively. Three patients had severe anemia out of which two died.



History of dyslipidemia in the past is proved to be insignificant (p 0.663) in predicting in-hospital death in our study. Two thirds of study subjects were known to have dyslipidemia.

**FIG – 10: DYSLIPIDEMIA AND ADHF**

Out of hundred patients, eighty nine patients got discharged after improvement of symptoms while eleven patients died in the hospital. Hence the mortality rate in our study is 11%.

## V. DISCUSSION

This is a short-term prospective study involving a sample size of hundred patients admitted in our medical college hospital. As discussed earlier, age is an important independent risk factor for heart failure development<sup>61</sup>. In our study, almost two thirds of patients are of the age of 51 – 70 years. The less number of patients in above seventy years category may be explained by a pronounced mortality rate due to disease progression, co-existing non-cardiac diseases and simply aging alone. However, the age factor has not affected the outcome of acute heart failure in our study.

Patients with NYHA grade I and II symptoms are least likely to get admitted rather than being managed on an out-patient basis with oral medications. Dyspnea and fatigability due to systemic and pulmonary congestion are the most common symptoms that bring the ADHF patient to medical attention. In ADHERE study which is registry based and includes thousands of patients, eighty nine percent patients presented with dyspnea whereas only thirty one percent of them complained of fatigue<sup>16,20</sup>.

The risk stratification model developed using factors which turned significant in hospital mortality prediction in large retrospective studies on ADHF patients (viz. ADHERE study and OPTIMIZE-HF study) indicated that lower systolic blood pressure on admission would mean a higher mortality rate<sup>16,17</sup>. In our study, lower systolic blood pressure could not discriminate between hospital survivors and non-survivors with statistical significance. A larger sample size might show results similar to those of the above landmark studies, as the current study of hundred samples clearly shows a trend of increasing mortality rate with decreasing systolic blood pressure. It has been found that higher systolic blood pressure levels even in the range above 180 mm Hg are not translated to a higher mortality rate. In contrast, a “practically” normal systolic blood pressure in the range of 120–140 mmHg is associated with an increased death rate<sup>80</sup>.

In ADHF patients especially with Ejection fraction has emerged as a significant prognostic indicator in our patients. Seven percent patients had severe LV dysfunction while sixty three percent patients had mild to moderate dysfunction. One third of patients had preserved systolic function and they could represent the subset of diastolic dysfunction causing acute decompensation. OPTIMIZE-HF registry study has found the left ventricular systolic dysfunction as a marker of higher mortality<sup>17</sup>.

The acute heart failure study by Lee et al has found a significant relation between low hemoglobin and adverse hospital outcome<sup>83</sup>. Our study has also found the same with a statistical significance of p value of 0.01. Hemodilution due to volume overload in such patients may cause apparently low HB level<sup>20</sup>.

One third of study patients had a history of systemic hypertension while one fourth was found to be diabetic. Nearly half of study patients were known case of coronary artery disease and dyslipidemia was found in two thirds of them. None of them could statistically influence the hospital outcome of study subjects.

The duration of hospital stay before the study endpoint varies widely, ranging from one to thirty four days. Notably, nine out of eleven patients who died have died within three days of admission. The one who died after eight days was a case of thyrotoxic cardiomyopathy due to hyperthyroidism. His underlying disease was uncontrollable and difficult to manage. The one who has died after fourteen days was a case of infective endocarditis complicating rheumatic heart disease (mitral stenosis and mitral regurgitation). He grew staphylococcus aureus and was put on intravenous antibiotics. However, at the end of ten days, he developed myocardial abscess adjacent to the mitral valve apparatus and worsened his failure.

The longest stay with positive outcome was for continuous thirty four days. It was a male patient who had been receiving intravenous antibiotics for his isolated native tricuspid valve endocarditis without any structural lesion. He grew coagulase negative staphylococcus which was sensitive to vancomycin. His failure symptoms were transient and managed successfully with diuretic therapy. Surprisingly, he was not an intravenous drug abuser and had not undergone any invasive medical procedure in the recent past. The second most prolonged stay with a positive outcome was by a young male patient who was newly diagnosed with rheumatic heart disease.

Eleven out of hundred patients died and the mortality rate of our study was eleven percent. The mortality rate of those two landmark studies were 4-4.2% and 3.8%<sup>16,17</sup>. Similar studies have reported an in-hospital mortality rate of 8.2-8.9% and 19%<sup>83,84</sup>. Though all these are registry based retrospective studies, they include very large number of patients in the range of thousands which make their results more reliable and accountable. All these studies have originated from western population. A similar retrospective study in 1949 on Indian patients admitted with cardiac failure reported an in-hospital mortality rate of 27.5%<sup>18</sup>. Another Indian study has reported an in-hospital death rate of 12.41%, but it included only patients with acute ST elevation MI as the cause of heart failure<sup>85</sup>. Four factors have emerged as significant predictors of hospital outcome in our study, viz. NYHA grade, peripheral edema, ejection fraction, heart rate and hemoglobin.

## VI. CONCLUSION

Due to the changing pattern of risk factors, the incidence and prevalence of heart failure are on the rise especially in India. Resultantly, the number of hospital admissions required for management of acute decompensated heart failure is also ever increasing. Several mechanisms underlie the relentless progression of chronic heart failure even on optimal treatment, a fact that remains as a major challenge for the medical fraternity. However, in the event of acute decompensated heart failure, there are certain factors that can acutely influence the survival of admitted patients. Unfortunately, a huge lacuna exists in the literature for data on Indian patients. Large-scale Indian studies are needed so that management strategy and guidelines specific for Indian ADHF patients especially in resource restrained settings can be devised.

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