Section: General Medicine

Original Research Article

ACUTE DECOMPENSATED HEART FAILURE: CLINICAL PROFILE, RISK FACTOR ASSESSMENT AND OUTCOME

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Received *: 03/02/2025*
Received in revised form *: 05/04/2025*
Accepted *: 21/04/2025*

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DOI: 10.70034/ijmedph.2025.2.119

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (2); 665-671

ABSTRACT

Background: 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. The aim is to study the clinical profile, risk factor assessment and outcome of patients with ADHF admitted in Gandhi Hospital.

Materials and Methods: It is Observational study done in 500 Patients of any gender above or equal to 15years of age at the time of hospital admission and fulfilling Boston Criteria for heart failure. Meticulous history and clinical examination were done in all pts.

Results: Acute decompensated heart failure is common across all age groups though more frequent in 50 – 70 years age group. Males constitute the larger proportion of patients admitted for ADHF. Poor NYHA grades are strongly associated with increased in- hospital mortality rate. Presence of peripheral edema is a significant discriminator of in- hospital survivors and non-survivors. Approximately three fourth of admissions is for recurrent ADHF. Ischemic and non-ischemic risk factors underlie equal proportion of ADHF cases. Lower ejection fractions are correlated with higher hospital death rate. Two third of study patients are known hypertensive while one fourth of them are known diabetic. Nearly half of study patients are known to have coronary artery disease while two thirds of them have dyslipidemia. None of them could significantly influence the hospital outcome of study subjects. Lower the hemoglobin level, higher the in-hospital mortality rate. Maximum deaths occurred when the duration of the hospital stay is more than 10days in the initial five days of admission. The in-hospital mortality rate of our study is 11%.

Conclusion: Totally Four factors predict mortality in patients admitted with ADHF in our study. They are poor NYHA grade, presence of peripheral edema, low ejection fraction, low hemoglobin level.

Keywords: Heart Failure reduced ejection Fraction(HFrEF), Acute Decompensated Heart Failure (ADHF), Chronic obstructive pulmonary diseases (COPD).

INTRODUCTION

With the turn of the century, cardiovascular diseases (CVDs) have become the leading cause of mortality in India.[1] In comparison with the people of European ancestry, CVD affects Indians at least a decade earlier and in their most productive midlife years.[2] For example, in Western populations only 23% of CVD deaths occur before the age of 70 years; in India, this number is 52%.[3] In addition, case fatality attributable to CVD in low-income countries, including India, appears to be much higher than in middle- and high-income countries. The World Health Organization (WHO) has estimated that, with the current burden of CVD, India would lose $237 billion from the loss of productivity and spending on health care over a 10- year period (2005– 2015).[4] Reasons for the high propensity to develop CVD, the

high case fatality, and the high premature mortality include biological mechanisms, social determinants, and their interactions. Addressing this significant burden requires an understanding of both the biological and social determinants, and the complex dynamics underlying their interaction, as well. In this review, we summarize the CVD burden in India, the reasons for the high burden, prevention and treatment strategies for CVD, and future policy strategies to pursue.[5-7]

The epidemiological transition in India in the past 2 decades has been dramatic; in a short timeframe, the predominant epidemiological characteristics have transitioned from infectious diseases, diseases of under nutrition, and maternal and childhood diseases to non communicable diseases (NCDs). The disease burden attributable to maternal disorders, measles, protein-energy malnutrition, and diarrheal diseases decreased >50% in the past 2 decades, whereas life expectancy at birth increased from 58.3 to 65.2 years, resulting in the ageing of the population during the same period.[8] Consequently, the NCD burden increased rapidly in India, with a proportional rise in burden attributable to CVD.8 Nearly two-thirds of the burden of NCD mortality in India is currently contributed by CVD-related conditions.[5] Despite wide heterogeneity in the prevalence of risk factors across different regions (explained below), CVD is the leading cause of death in all parts of India, including the poorer states and rural areas. The disease transition in India in the past 2 decades resembles the accelerated epidemiological transition model with a rapid shift to the age of delayed chronic diseases. These studies are superior to pre-designed clinical trials which include carefully selected patients and whose results cannot be effectively applied in routine clinical practice. There are sporadic reports that have studied the etiology of congestive cardiac failure and precipitating factors of ADHF in Indian patients admitted in Indian hospitals.[6]

The death rate due to cardiac diseases has declined significantly in the US in the last 15 years even as it continues to rise in India with cardiovascular diseases being the leading cause of death, underlining the need for the country to adopt population-level strategies to reduce risk factors.

MATERIALS AND METHODS

It is observational study in Gandhi Hospital, Secundrabad Dec 2017 to May 2019. During the study period 500 patients are taken in the study

Inclusion Criteria

Patients of any gender above or equal to 15years of age at the time of hospital admission and fulfilling Boston Criteria for heart failure

Exclusion Criteria

Liver failure, Renal failure, Volume overload Hypoproteinemia Myxoedema, hypothyroidism

A total no of 500 patients hospitalized for ADHF in Gandhi hospital satisfied for inclusion and exclusion criteria were selected for the study. Meticulous history and clinical examination were done in all pts. A detail history regarding the risk profile in patients including systemic HTN, DM, CAD, CRHD, COPD, smoking, alcohol, dyslipdemia was documented. Clinical evaluation of physical parameters such as Pulse, temperature. BP, HR were performed. Detailed systemic examination was done for Heart Sounds, Breath sounds like crackles wheeze and other systems also examined in detail. All patients were investigated for basic biochemical and heamatological investigations along with ECG, chest X-RAY, ABG, Serum electrolytes 2D ECHO was done in all patients.

RESULTS

In our study of 500 patients, a maximum of three hundred patients fall in the 51-60 years age window and it is followed by 41-50 years age category that includes hundred patients. The number of patients drops down to fifty in the category of 61-70 years age, followed by 31-40 (40). The least number of patients is naturally in the 20- 30 years category (ten in number).

Table 1: Age and gender wise-hospital mortality of the study population.

Age in years	Patient Died	Patient Alive	Total	P-value	OR (95% CI)
21-30	3(30%)	7 (70%)	10	0.728	1.068 (0.303 - 3.761)
31-40	5 (12.5%)	35 (87.5%)	40		
41-50	10 (10%)	90(90%)	00		
51-60	29(9.6%)	271(90.3%)	00		
61-70	8(16%)	42(84%)	50		
Total	55	445	00		
Gender					
Male	30 (10%)	270 (90%)	300	.317	0.556 (.161 – 1.915)
Female	25 (12.5%)	175 (87.5%)	0 200		

Age has not emerged as a significant factor (p 0.728) for mortality prediction in ADHF patients of our study. In our study, 300 out of 500 patients are males and there is no significant relationship (p 0.317) between sex and in-hospital mortality.

Table 2: Represents the clinical examination of the Patients..

Complaints	Number of Patients N=500	%
Breathlessness	500	100%
Peripheral edema	175	35%
Cough	220	44%
Palpitation	105	21%
Chest Pain	140	28%
Fever	80	16%
General Physical Examination		
Raised JVP	215	43%
Basilar Lung Crackles	410	82%
Lung crackles above the basal point	75	15%
Wheezing	90	18%
S3	230	46%
Hepatomegaly	40	8%
Classification of ADHF		
HFrEF	360	72%
HFpEF	100	20%
Isolated Right heart Failure	30	6%
Highout put Heart Failure	10	2%

In the current study for the classification of ADHF 72% of the patients presented with HFRrE, 20% of patients with HFPEF, 6% of patients presented with isolated right heart failure and 2% with high output heart failure. In the current study, most common risk factor is Hypertension followed by patients having CAD, one third of the patients having diabetes and CRHD as risk factors. In the isolated right heart failure patients COPD is the risk factor. Most of the patients in our studying having Dyslipidemia and Alcholic as risk factor.

Table 3: Smoking and Diabetes versus in-hospital mortality

Smoking	Patient Died	Patient Alive	Total	P- value	OR (95% CI)
Smoker	30 (13.04%)	200 (86.95%)	230	0.149	0.400(0.101 – 1.578)
Non- smoker	25 (9.25%)	245 (90.75%)	0 270		
Total	55	445	500		
DM					
Yes	5 (19.23%) 1	05 (80.77%)	130	0.147	2.279 (0.654 – 7.938)
No	30(8.1%)	40 (91.9%)	370		
Total	55	445	500		

Nearly half of our patients were smokers. It has not emerged significant (p 0.149) for predicting in-hospital mortality in our study. One fourth of our patients were known diabetic in the past. The diabetic status of study subjects does not correlate (p 0.147) with their death in hospital.

Table 4: Systemic Hypertension, NYHA grading and Peripheral edema versus in-hospital mortality

SHT	Patient Died P	Patient Alive	Total	P-value	OR (95% CI)
Yes	50 (15.15%)	290 (87.8%)	330	0.382	1.451 (0.406 – 5.181)
No	5 (2.94%)	165 (97.06%)	170		
Total	55	445	500		
NYHA					
Grade 4	24 (19%)	101 (81%)	125	0.012	6.000 (1.242 – 28.987)
Grade 3	24 (8%)	276 (92%)	300		
Grade 2	3 (4%)	72 (96%)	75		
Total	55	445	500		
Peripheral edema					
Present	35 (20%)	140 (80%)	175	0.037	3.000 (0.875 – 10.286)
Not present	20(6%)	305 (94%)	325		
Total	55	445	500		

History of systemic hypertension in the past does not affect (p 0.382) the hospital outcome of patients in our study. Nearly two thirds of our study subjects were known hypertensive. The NYHA grade among our patients on admission fall into three categories vizgrade 2, grade 3 and grade 4. The proportion of grade 4 patients (19%) is higher than that of grade 3 patients (8%) in the dead category. Also the proportion of grade 3 patients (8%) is greater than grade 2 (4%). On statistical comparison also, the NYHA grading factor has turned out to be a significant predictor (p 0.012) of in- hospital mortality. Peripheral edema on admission was present in 35% of patients while absent in 65% of patients. It is found to be a significant predictor (p 0.037) of in-hospital mortality on statistical comparison. It resembles the factor of NYHA grade on admission.

Table 5: Prior ADHF and Risk Factors versus in-hospital mortality Tv

Prior ADHF	Patient Died	Patient Alive	Total	p-value	OR (95% CI)
Recurrent	50 (14.28%)	300 (85.71)	350	0.114	2.667 (0.783 – 9.018)
First Time	5 (3.3%)	145 (96.66)	150		
Total	55	445	500		
Risk Factors					
Ischemic	40(17.02%)	195 (82.97%)	235	.764	1.146 (0.343 – 3.831)
Non- ischemic	15 (5.6%)	250 (94.33%)	265		
Total	55	445	500		
Hemoglobin (gm %)					
<9	10 (66.7%)	5 (33.3%)	15	0.01	14.72 (1.805 – 120.67)
9 – 11.9	40 (13.3%)	260 (86.7%)	300		
≥12	5 (2.7%)	180 (93.3%)	185		
Total	55	445	500		
Serum sodium					
< 125	0	0	0	0.273	1.842(0.542 – 6.256)
25 - 135	35 (15.55%)	190 (84.45%)	225		
or= 135	20 (7.27%)	255 (92.73%)	275		

Nearly three fourth of the admissions were recurrent ADHF However, it is not a significant risk factor (p 0.114) for in-hospital death. Nearly half of them have an underlying ischemic etiology while the rest have non- ischemic cause for their ADHF. There is no statistical significance (p 0.764) for this admission factor. 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 ten died. Serum sodium level has not emerged significant (p 0.273) when correlated with the in-hospital mortality. None has presented with severe hyponatremia while there are significant proportion of patients with mild hyponatremia.

Table 6: Systolic BP, Heart rate, QRS duration and Ejection fraction % versus in-hospital mortality

Systolic BP (mm Hg)	Patient Died	Patient Alive	Total	P-value	OR (95% CI)
< 90	15 (50%)	15 (50%)	30	.16	2.133 (0.596 – 7.624)
90-120	10 (4.8%)	110 (95.2%)	120		
≥120	30 (4.2%)	320 (95.8%)	350		
Heart Rate (per min)	Patient Died	Patient Alive	Total	P-value	OR (95% CI)
< 100	15 (7.5%)	185 (92.5%)	200	0.29	1.897 (0.471 – 7.635)
100 - 119	35(18.9%)	150 (81.1%)	185		
>or= 120	5 4(35%)	110 (95.65%)	115		
QRS duration					
Yes	30(17.6%)	40(82.4%)	170	.187	2.143 (0.634 – 7.238)
No	25 (7.6%)	05 (92.4%)	330		
Ejection fraction%					
< 30	5 (14.3%)	30 (85.7%)	35	0.003	21.78 (2.657 – 178.58)
30 – 50	40 (12.7%)	275 (87.3%)	315		
>50	10 (6.7%)	140 (93.3%)	150		

In our study, 95.84% of patients with systolic BP more than 110 mmHg, 95.2% of those with systolic BP of 80 – 109 mmHg, and 50% of those with systolic BP of less than 80 mmHg have survived and got discharged. This seems to be an occurrence bychance as the p value is more than 0.05 (ie. 0.16). The admission heart rate is not an indicator of in-hospital mortality in our study (p 0.29), The QRS duration in ECG on admission was analyzed and found to be insignificant (p 0.187) in predicting hospital death.

Severity of systolic dysfunction (low ejection fraction) is significantly associated (p 0.003) 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.

Table 7: CAD and Dyslipidemia versus in-hospital mortality

CAD	Patient Died	patient Alive	Total	P-value	OR (95% CI)
Yes	25 (10.63%)	210 (89.37%)	235	0.694	1.146 (0.343 – 3.831)
No	30 (11.32%)	235 (88.68%)	0 265		
Total	55	445	500		
Dyslipidemia					
Yes	30(9.3%)	290(90.7%)	320	0.492	0.761 (0.223 – 2.600)
No	25(13.9%)	155(86.1%)	180		
Total	55	445	500		

History of acute coronary event in the past does not emerge as a significant predictor (p 0.694) of hospital mortality in our study. Forty seven percent of our patients were known case of coronary artery disease. Surprisingly, there is no much difference in mortality rate between those with CAHD and those without CAHD. History of dyslipidemia in the past is proved to be insignificant (p 0.492) in predicting in-hospital death in our study. Two thirds of study subjects were known to have dyslipidemia.

Table 8: Number of days of hospital stay versus in-hospital mortality

Hospital stay (days)	Patient Died	Patient Alive	Total	p-value	OR (95% CI)
1- 5	45 (16.36%)	230 (83.64%)	275	0.069	0.237 0.048 – 1.163)
6 - 10	5 (2.4%)	200 (97.6%)	205		
>10	5 (25%)	15 (75%)	0 20		
Total	55	445	500		

Number of days of hospital stay does not bear any relationship with the hospital outcome in our study. The p value drifts towards significance, but not significant. Number of deaths is highest (nine in number) in the initial five days of admission. The mortality rate is highest (25%) when the hospital stay prolonged for more than ten days. Out of five hundred patients, four hundred forty five patients got discharged after improvement of symptoms while fifty five patients died in the hospital. Hence the mortality rate in our study is11%.

DISCUSSION

This is an observational study involving a sample size of five hundred patients admitted in our hospital. As discussed earlier, age is an important independent risk factor for heart failure development. 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. Almost three fourth of our patients were male and it can be partly explained by life style aspects such as smoking, alcoholism, etc that are specific for men at least in India.

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 offatigue.[7] In our study chief complaints with which patient presented is breathlessness (100%) followed by cough (44%), pedaledema (35%), palpitation (21%), chest pain was present in (28%) and fever in (16%) of patients. Peripheral edema, is found to be a significant predictor in our study. Mortality is significantly high in patients having peripheral edema compared with absence of peripheral edema. On General examination 46% of patents are found to be have S3 gallop, 43% with raised JVP, basal crackles were present in 82% of patients, lung crackles above the basal point were present in 15%. Wheezing was present in 18% of patients and only 8% of patients had hepatoegaly. As mentioned in the previous pages, various factors and mechanisms contribute to the final pathway of adverse re modeling of ventricular myocardium in chronic cardiac failure. And this pathological process may get accelerated whenever an event of acute decompensation occurs resulting in hospitalization. In support of this paradigm, it has been well-observed clinically that each decompensation episode additively and negatively affects the long term prognosis of heart failure patients.[8] In our study, the hospital mortality rate is high (20%) in patients with recurrent ADHF when compared to those with new onset ADHF (7.2%).

Ischemic and non-ischemic risk factors underlying the acute decompensation in our study share nearly half number of patients between them. Twenty nine percent patients in our study had preserved ejection fraction and the remaining seventy one percent patients had depressed ejection fraction which means that our study is dominated by patients with systolic dysfunction. In most of the western studies on systolic heart failure, ischemic heart disease remained the foremost etiology. However, in systolic heart failure studies involving women, minorities and Blacks, non-ischemic etiologies such as systemic hypertension, diabetes mellitus scored over the ischemic causes. Hence, the etiological profile of our study involving Asian men and women coincides with those of neither of them.[9] 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.[7] In our study, also there is a high mortality in patients admitted with lower systolic BP, lower systolic blood pressure on admission leads to a higher mortality rate. 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 deathrate.[10]

In ADHF patients especially with impaired ejection fraction, QRS duration in ECG plays an important role in deciding about management strategies. Duration of more than 0.12 seconds is suggestive of ventricular dyssynchrony/asynchrony and is an indication for therapeutic resynchronization. Because of disharmony between the atria and the dilated ventricles, further attenuation of cardiac output occurs worsening the failure. Prolongation of QRS duration exists in conditions such as bundle branch blocks, dilated cardio myopathy, etc which normally have a depressed systolic function.[7] In our study, one third patients had QRS duration of more than 120 milliseconds and eighteen percent of them died.

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. Two percent of patients having high output heart failure, 6 percent of patients are having isolated right heart failure. OPTIMIZE-HF registry study has found the left ventricular systolic dysfunction as a marker of higher mortality.[11] Due to neurohormonal changes and various medications, most patients with ADHF do have a mild degree of dyselectrolytemia. Mild to moderate hyponatremia is a common occurrence in such patients. In general, around twenty five percent of ADHF patients have mild hyponatremia and even lesser percentage show markedly lower level of sodium. Nevertheless, a low sodium level is found to be translated to adverse hospital outcome in various ADHF studies.[12,13] In our study, nearly half of them presented with mild to moderate hyponatremia while none had severe hyponatremia.

The acute heart failure study by Lee et al has found a significant relation between low hemoglobin and adverse hospital outcome.[13] 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. Three fourth 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 fifteen days and most of the deaths caused on first and second day of admission and also when hospital stay is prolonged for more than 10 days. Fifty five out of five 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%.[7] Similar studies have reported an in-hospital mortality rate of 8.2-8.9% and 19%. 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%. 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.[14] Four factors have emerged as significant predictors of hospital outcome in our study, viz. NYHA grade, peripheral edema, ejection fraction, hemoglobin and factors, ejection fraction, is more strongly associated with hospital outcome.

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. Of late, western investigators have shown an enhanced interest in identifying and assessing those important factors because of which we now have several studies such as ADHERE, OPTIMIZE- HF, etc. Unfortunately, a huge lacuna exists in the literature for data on Indian patients.

Among the factors that emerged as significant predictors in our study, some are similar and some are different from those of large western studies. Though ours is a small study, it could still mean that the predictors of in- hospital mortality in Indian subset of patients admitted with ADHF might be partially or entirely different. It needs to be confirmed by large-scale Indian studies so that management strategy and guidelines specific for Indian ADHF patients especially in resource restrained settings can be devised.

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