Original Research Article

A STUDY OF CLINICAL PROFILE AND OUTCOME OF DE NOVO ACUTE HEART FAILURE PATIENTS IN TERTIARY CARE HOSPITAL IN SOUTH INDIA.

ABSTRACT

Introduction: Acute heart failure is widely described as the sudden emergence of new or worsening Heart failure signs and symptoms. With a better understanding of the many risk factors and etiology of heart failure, attention to the finer points of heart failure care with novel diagnostic techniques and various outcomes and prognosis of AHF patients, this study will assist us in providing a clearer understanding of the analysis of numerous risk factors, etiology, and outcomes of patients with acute heart failure. To study the clinical profile, etiology, and outcome of DE NOVO acute heart failure in a tertiary care centre and to identify their co-morbidities and factors associated with increased mortality.

Methodology: A total of 110 patients were taken into the study after informed consent and passing inclusion and exclusion criteria. Hospital records & databases confirmed, based on the proforma and symptomatology questionnaire, patient characteristics taken, BMI, lifestyle and personal habits were noted. On admission, blood investigations like NT-Pro-BNP, CBC, LFT, RFT, +/- anaemia profile, blood, and urine C/S, kerley B lines, and ECHO assessment for Left ventricular function were done and analyzed.

Results: Diabetes (70%) and Hypertension (67.3%) are the common co-morbidities associated with heart failure. Ischemic heart disease (48.2%) is the most common etiology. Atrial fibrillation is the most common arrhythmia (12.7%), and iron deficiency anaemia (81%) is one of the preventable precipitating factors of acute heart failure. Our study shows a mortality rate of 6.4%. Cerebrovascular events were noted in a greater number of patients.

Conclusion: Our study is a cutting-edge investigation of de novo acute cardiac failure stating the relationship between polyvascular disease and the higher incidence of risk factors.

Keywords: De Novo Acute heart failure, Cardiovascular disease, Ischemic heart disease, Cerebrovascular events, Left ventricular dysfunction.

LIST OF ABBREVIATIONS

NYHA – New York heart association

PND – Paroxysmal nocturnal dyspnea

NT-pro-BNP - N-terminal pro-B-type natriuretic peptide

CAG- Coronary angiography

IHD - Ischemic heart disease

HFrEF – Heart failure with a reduced ejection fraction

HFmrEF – Heart failure with a mid-range ejection fraction

HFpEF – Heart failure with a preserved ejection fraction

1. INTRODUCTION

Acute heart failure (AHF) represents a broad spectrum of disease states, with heterogeneous clinical presentations, but is commonly characterized by either a rapid onset or a progressive worsening of signs and symptoms, requiring immediate treatment and thus leading to urgent hospitalization[1]. HF is a global pandemic reported to be affecting 1–2% of the adult population[2]. As there may be unrecognized/undiagnosed HF cases worldwide, the true prevalence is likely to be higher.

The prevalence of HF increases with age: from around 1% for people aged < 55 to >10% in those aged 70 years and above[3]. Framingham heart study has reported that the incidence of heart failure was significantly higher in males than females with an age-standardized incidence ratio of 1.67:1[4]. The prevalence of HF among our Indian population is about 1% of the population or about 8–10 million individuals[5].

As AHF is a heterogeneous condition, management may differ according to the clinical presentation of patients. Management of those symptoms starts with the search for

specific causes of AHF. The common causes of HF include ischemic heart disease, Myocardial infarction, hypertension, and valvular storage disorders[6].

The risk factors of heart failure that are more common were hypertension (seen in 73.21%), ischemic heart disease (seen in 52% of patients) and Diabetes mellitus (seen in 26.78%)[7].

AHF may present as the first manifestation of HF (new onset) or due to acute decompensation of chronic HF compared to patients with acutely decompensated CHF. Those with new-onset HF may have higher in-hospital mortality. Clinical severity and in-hospital course are determined by the complex interplay between precipitants, the risk factors, and the patient's comorbidities.

The prognosis is also reported to be very poor after discharge. The mortality risk after hospitalization has been reported to be 33% per year[8]. A study conducted by Krumholz HM et al.. reports that 44% of discharged patients were again hospitalized at least once in 6 months[9].

With a better knowledge of various risk factors and etiology of Heart failure, addressing the finer details of heart failure management with newer diagnostic modalities and various outcomes and prognosis of AHF patients, this study will help us give a better insight into the analysis of various risk factors, etiology, and outcome of patients with acute Heart failure.

2. METHODOLOGY

Our study is aimed at studying the clinical profile, etiology, and outcome of DE NOVO acute heart failure in a tertiary care centre to identify the factors associated with increased mortality.

2.1. MATERIALS AND METHODS

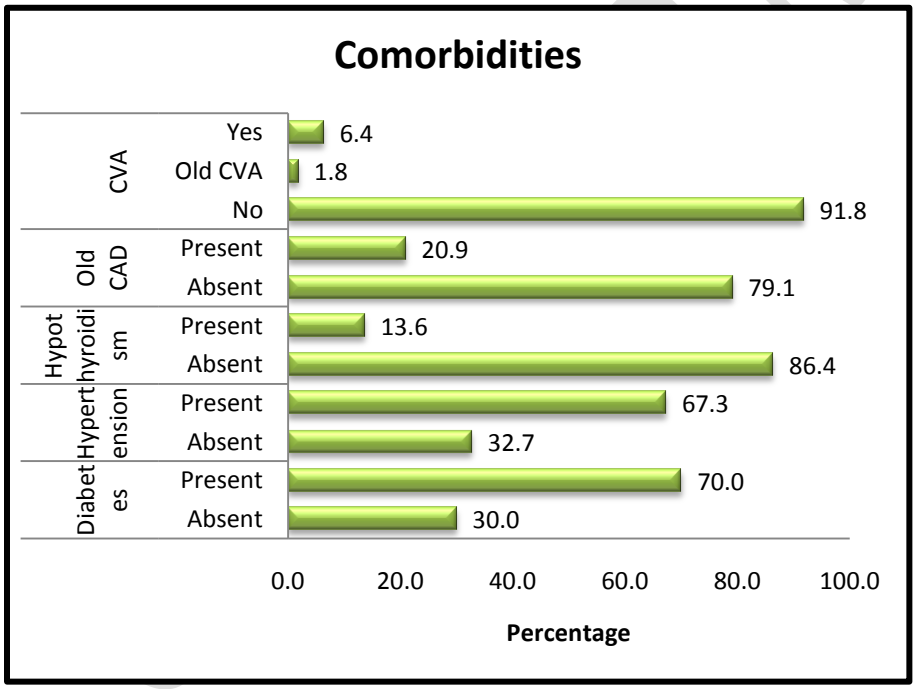
It is a hospital-based prospective observational study with urban/rural male & female patients. Study done from July 2021 to December 2022 in Apollo Hospital after getting Institutional Ethical Committee (IEC) clearance. Inclusion criteria - Age > 18 years, all patients Newly admitted for acute heart failure, for whom intravenous (IV) therapy (Inotropes, vasodilators, or diuretics) is needed, Acute heart failure resulting from ACS. The study included all patients diagnosed with 1st episode acute heart failure per Boston Criteria. Major exclusion criteria - known chronic heart failure patients, Acute exacerbation of COPD / BA, Septic shock. To identify patients with acute heart failure attending OPD, IP admission for intensive heart failure therapy. A total of 110 patients were taken into the study after getting informed consent and passing inclusion and exclusion criteria. The principal investigator then classified those patients based on Echocardiography and other parameters according to ESC heart failure guidelines 2016. Hospital records & databases confirmed, based on the proforma and symptomatology questionnaire, patient characteristics taken, BMI, lifestyle and personal habits were noted. On admission, blood investigations like NT-Pro-BNP, CBC, LFT, RFT, +/- anaemia profile, blood, and urine C/S, kerley B lines, and ECHO assessment for LV function were done and analyzed. A coronary angiogram was done if required. All data were instilled chronologically and were calculated statistically. Subgroup analysis were done for statistical significance. Statistical analysis was carried out by IBM SPSS Statistics for Windows version 25.0. All ‘p” values <0.05 were considered statistically significant.

3. RESULTS

The most common age group of our study population is 61-70 years (37.3%), in which males were predominant, contributing to 63%. 44.5% had normal BMI, and the rest were overweight and obese. 24.5% are smokers, and 29.1% are alcoholics. Our study showed 70% were diabetics,

67.3% were hypertensives, 13.6% were known hypothyroidism patients, 20.9% were CAD patients, 6.4% patients had CVA during admission, and 1.8% had CVA in the past, as shown in figure 1.

FIGURE 1: Comorbidities distribution (n=110)



The baseline characteristics of the study are given in Table 1. 56.2% had a long diabetic duration of 10-20 years. 20% of patients had Acute Kidney Injury (AKI) and 12.7% had chronic kidney disease (CKD). Based on symptom analysis, 35.5% had NYHA class II, 35.5% had NYHA class

IV dyspnea, 48.2% had orthopnea, and 40% had Paroxysmal nocturnal dyspnea (PND). 60% of patients were anaemic. Iron profiling was done only for 42 patients. Of these 42 patients, 34 (81%) had iron deficiency anaemia (IDA). 45.8% had HbA1c value of >8%. 57.3% of the patients had dyslipidemia. 47.3% of the patients had hyperuricemia.

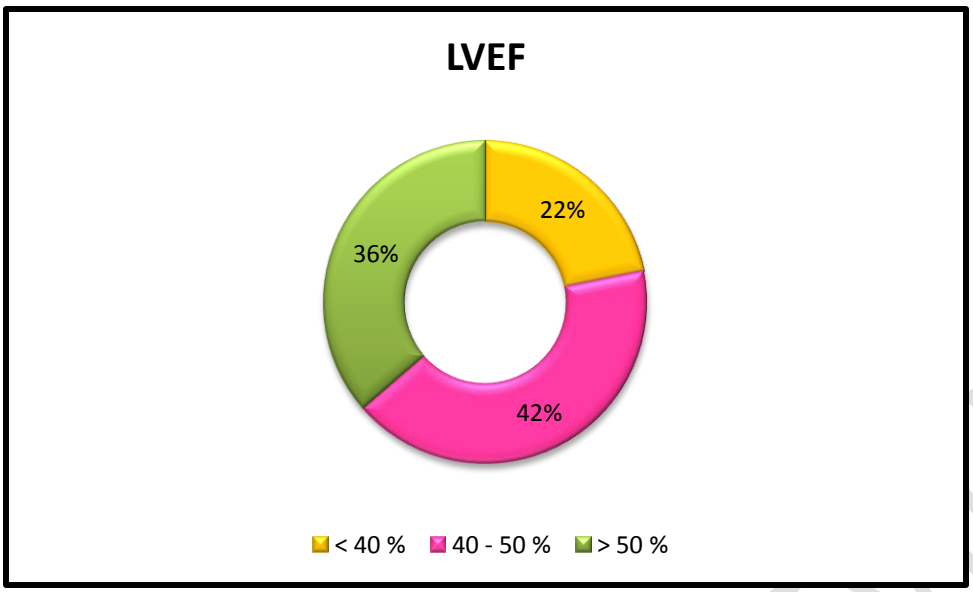
TABLE 1: Baseline Characteristics

Baseline Characteristics					
Parameters	**n**	**Mean**	**SD**	**Minimum**	**Maximum**
Age	110	64.4	12.4	30.0	98.0
BMI	110	26.6	5.3	15.6	48.7
Diabetes Duration	73	13.8	8.9	.5	40.0
Hypertension Duration	71	12.7	8.4	.5	40.0
Dyspnea NYHA Class	110	2.8	1.0	1.0	4.0
Admission HR	110	99.0	22.5	48.0	150.0

LVEF	110	48.2	11.5	30.00	70.00
LV Filling Pressure (E/E')	110	18.9	4.8	8.0	36.0
Creatinine	110	1.4	0.8	.6	5.1
TSH	109	2.9	2.8	.01	18.98
Hba1C	96	8.1	2.0	4.4	14.5
LDL	110	113.6	53.5	18.0	326.0
Uric Acid	110	7.0	2.5	2.4	15.2
Total Count	110	11347.6	5101.5	2200.0	34600.0
BNP	47	966.2	668.8	80.9	2810.0
SBP	110	145.6	34.3	80.0	240.0
DBP	110	85.7	19.2	40.0	140.0

15.5% of patients had hypotension and required ionotropic support during admission. 67.3% of patients had RWMA in echocardiographic assessment. Related to LV function, 21.8% had EF <40%, 41.8% had EF between 40-50%, and 36.4% had EF>50%, as shown below in Figure 2.

FIGURE 2: LVEF distribution (n=110)

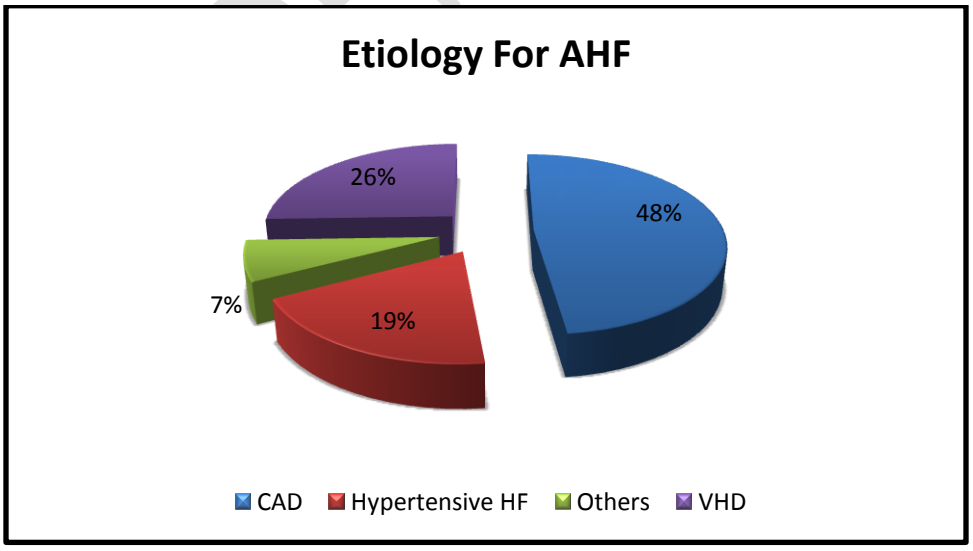


Regarding PAH, 7.3% had mild PAH, 20.0% had moderate PAH, and 13.6% had severe PAH. 84.5% had elevated filling pressures (E/e' >14). 53.6% had mild MR, 10.9% had moderate MR, and 6.4% had severe MR%. Atrial Fibrillation was the most common arrhythmia noted (12.7%), but most patients had normal sinus rhythm (65.5%). 56.1% of the patients had ACS at admission. Of the ACS patients, 48.4% had STEMI, and 38.7% had NSTEMI. On doing coronary angiography (CAG), 11.4% of patients had normal coronaries, 20.2% patients had insignificant CAD, 16.5% patients had SVD, 10.1% patients had DVD, and 41.8% patients had TVD. 20% of patients had single valve involvement, and 5.5% had double valve involvement. 26.3% of patients underwent PCI, 20% underwent CABG surgery, 0.9% underwent AVR surgery, 1.8% underwent MVR surgery, and 2.4% underwent Mitra clip procedure. Ischemic heart disease was the most common cause of heart failure (48.2%), as shown in Table 2 and Figure 3. Out of 110 patients, 6.4% had in-hospital Mortality.

TABLE 2: Etiology for AHF distribution (n=110)

Aetiology For AHF	Frequency	Percent
Ischemic Heart Disease	53	48.2
Hypertensive Heart Disease	21	19.1
Valvular Heart Disease	28	25.5
Others	8	7.2
Total	110	100.0

FIGURE 3: Etiology for AHF distribution (n=110)



4. DISCUSSION

Although previous literature and studies have been published on chronic heart failure, only a few studies have been done on de novo heart failure in India. This small prospective observational study helps to understand baseline characteristics, etiology, clinical, echocardiographic, biochemical parameters and clinical follow-up of the patients with de novo heart failure. The sample size for this short-term prospective study is 110 patients who have been admitted to our tertiary care facility with de novo heart failure.

4.1. Baseline characteristics

Age is a significant independent risk factor for the development of heart failure. The mean age of our study population was 64.4 years which is lesser when compared to studies done by Younis et al.. [15] and, Choi KH et al.. [12], Degoricija V et al.. [13,] where the mean age of patients with de novo heart failure was more than 70 years. Nearly half of the participants in our study group are 51 to 70 years old. Nearly two-thirds of our patients were men, similar to the study done by AlHabib KF et al.. [14]. The male preponderance has been demonstrated in other studies done by Younis et al.. [15], Choi KH et al.. [12] and Degoricija V et al.. [13]. The male preponderance can be partially attributed to male-specific lifestyle factors, at least in India, like smoking, alcoholism, and work stress. In our study, 24.5% of the patients had a smoking habit which is lesser compared to studies done by AlHabib KF et al.. [14], Choi KH et al.. [12,] and Degoricija V et al.. [13]. Diabetes and hypertension are the common risk factors for heart failure, It has been well documented for de novo heart failure as well. In our study population, 70% of the patients had diabetes which is higher than the study done by AlHabib KF et al.. [14] and Younis et al.. [15], where the prevalence of

diabetes was 61.3% and 41%, respectively. 45.8% of the study population had uncontrolled diabetes mellitus (HbA1C >8%). In our study, 67.3% were hypertensive, which is similar to the previous study done by Pranata R et al.. [11].

Dyslipidemia is one of the risk factors for coronary artery disease, indirectly leading to ischemic heart failure. In our study population, 57.3% had dyslipidemia which is more than the study done by AlHabib KF et al.. [14], where 32% had dyslipidemia. Renal insufficiency as evidenced by elevated urea and impaired creatinine clearance, is an important risk factor for in-hospital mortality, especially when it worsens during hospital stay. It may be complicated by renal insufficiency, which can lead to volume overload even in patients with preserved left ventricular function and normal cardiac output. In our study, nearly one-third of the population had renal insufficiency (AKI or CKD), similar to the study done by AlHabib KF et al.. [14]. Hypotension requiring ionotropic support is seen in 15.5% of patients in our study population.

4.2. Clinical features

Dyspnea and fatigue brought on by systemic and pulmonary congestion are the most prevalent symptoms that drive an ADHF patient to the doctor's OPD. Patients with NYHA grade I and II symptoms are likelier to get oral medications in an outpatient setting rather than hospitalized. Hypertension, diabetes, and obesity are strong independent risk factors for heart failure, as shown by De Simone et al.. [10]. In the ADHERE research, which is registry-based and comprises thousands of patients, 89% reported dyspnea. However, only 31% of them also reported fatigue. More than half of our patients had class III-IV dyspnea, and one-third had class II dyspnea. 48.2% of the study population had orthopnea, and 40% had paroxysmal nocturnal dyspnea. In a study done by AlHabib KF et al.. [14], ischemic heart disease was seen in one-third of the patients,

whereas in our study IHD was seen in 20.9% of the patients. AlHabib KF et al.. [14], 8.1% had a past history of CVA, whereas in our study it was 1.8%.

4.3. Etiology

Ischemic heart disease (IHD) is one of the leading causes of heart failure, and in the previous studies by Younis et al.. 15, 72% had CAD, which is in contrast to our study, which had 48.2% of patients with IHD. Hypertensive heart disease is one of the most common causes for de novo heart failure[11]. In a study by AlHabib KF et al.. [14], hypertensive heart disease was the cause for heart failure in 23.35% of the study population and study by Younis et al.. [15], hypertensive heart disease was seen in 40% of de novo heart failures. Hypertensive heart disease was seen in 19.1% of the patients, which is lower when compared to previous studies done on de novo heart failure.

Valvular heart disease was seen in 25.5% of our study population, similar to the study done by Younis et al.[15] , where the incidence of valvular heart disease was 21%.

4.4. Precipitating factors

Acute coronary syndrome was the precipitating factor for heart failure in 48.2% of the study population, which was similar to the study by Younis et al.. [15] and AlHabib KF et al.. [14], where ACS was a precipitating factor for heart failure in 54% and 52.5 % of the patients respectively.

In our study population, Atrial fibrillation was a precipitating factor in 12.7% of the patients, similar to the study done by AlHabib KF et al.[14], where AF was seen in 10.5% of the patients. While in a study done by Younis et al.[15], the incidence of AF was higher (24%). Anaemia is one of the causes that can precipitate heart failure. In our study, Iron profiling was done only for 42 patients, of which 81% had Iron deficiency anaemia.

4.5. Echocardiographic features

In our study population, 21.8% had HFrEF, 41.8% had HFmrEF, and 36.4% had HFpEF, which is different from the study by AlHabib KF et al.[14]. Mean LVEF in our study population was 48.2% which is slightly higher than study done by Younis et al.[15]. In our study population 30% patients had anterior wall hypokinesia, 16.4% had inferior wall hypokinesia, 20.9% had global hypokinesia and 32.7% had no RWMA. In our study population, nearly one-third of patients had left ventricular hypertrophy, and more than 3/4th of patients had elevated filling pressures. In our study population, 6.4% of patients had severe MR, and 13.6% of patients had severe PAH.

4.6. Procedures done

In our study population, 79 patients underwent coronary angiogram (CAG), in which 11.4% patients had normal coronaries, 20.2% patients had insignificant CAD, 16.5% patients had single vessel disease (SVD), 10.1% patients had double vessel disease (DVD), and 41.8% patients had triple vessel disease (TVD).

In our study population, 26.3% of patients underwent percutaneous coronary intervention (PCI), 20% of patients underwent CABG surgery, 0.9% of patients underwent aortic valve replacement (AVR) surgery, 1.8% of patients underwent mitral valve replacement (MVR) surgery, and 2.4% patients had undergone Mitra clip procedure.

4.7. Outcomes

All the patients were followed up for a period of 3 months. Major adverse cardiovascular and cerebrovascular events were evaluated. 6.4% had hospital death in our study population, which was similar (6.2%) to the study done by AlHabib KF et al.[14] and slightly higher than the study

done by Degoricija V et al.[13] , where the in-hospital mortality was 4.3%. The cerebrovascular events in our study population were 6.4% which was higher than the stroke in a study done by AlHabib KF et al.[14], where the incidence of stroke was 2.8%.

5. CONCLUSIONS

Our study is one of the novel studies done for de novo acute heart failure in India. Diabetes and hypertension were the most common comorbidities associated with heart failure, which is well documented in our study. Ischemic heart disease is the most common etiology for Acute De novo heart failure in our study, followed by valvular heart disease. Among the valves, mitral valve involvement is seen in most of the patients. Iron deficiency anaemia is seen in more than 80% of patients, becoming a preventable precipitating factor for acute heart failure. Atrial fibrillation is the most common arrhythmia that is precipitating acute heart failure. Cardiogenic shock is seen in around 15% of patients. Triple vessel disease in coronary angiograms is seen in most patients in whom percutaneous coronary interventions were done for more patients than coronary bypass graft surgery. Most of the patients fall into the HFmrEF category. Our study shows a mortality rate of 6.4%, similar to previous studies in de novo acute heart failure. Cerebrovascular events were noted in more patients than in previous studies on de novo acute failure. This could be attributed secondary to the higher prevalence of risk factors and the association of polyvascular disease.

6. LIMITATIONS

It is a single-centered study with limited sample size; the majority are urban population; hence, the study's results cannot represent the whole population. Other risk factors, like infections, were not investigated in this study. Contributing to heart failure was not included in the study criteria.

Those patients with normal coronaries and severe left ventricular dysfunction need further detailed cardiac evaluation like cardiac MRI and PET scan for a complete diagnosis.

7. RECOMMENDATIONS

A multicenter study is needed in India for a better understanding of de novo acute heart failure in classifying, diagnosing, treating, and preventing acute heart failure. A long-term follow-up study is needed for better management and prognostication of acute de novo heart failure: more imaging modalities and risk factors association to be studied.

8. REFERENCES

1. Gheorghiade M, Mebazaa A. Introduction to acute heart failure syndromes. American Journal of Cardiology. 2005 Sep 19;96(6):1-4.
2. Mosterd A, Hoes AW. Clinical epidemiology of heart failure. heart. 2007 Sep 1;93(9):1137-46.
3. van Riet EE, Hoes AW, Wagenaar KP, Limburg A, Landman MA, Rutten FH. Epidemiology of heart failure: the prevalence of heart failure and ventricular dysfunction in older adults over time. A systematic review. European journal of heart failure. 2016 Mar;18(3):242-52.
4. Ho KK, Pinsky JL, Kannel WB, Levy D. The epidemiology of heart failure: Framingham Study. JACC. 1993;22(Suppl A):6A-13.
5. Chaturvedi V, Parakh N, Seth S, Bhargava B, Ramakrishnan S, Roy A, Saxena A, Gupta N, Misra P, Rai SK, Anand K. Heart failure in India: the INDUS (INDia ukieri study) study. Journal of the Practice of Cardiovascular Sciences. 2016;2(1):28-35.
6. James SL, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N, Abbastabar H, Abd-Allah F, Abdela J, Abdelalim A, Abdollahpour I. Global, regional, and national

incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet. 2018 Nov 10;392(10159):1789-858.

7. Lawson CA, Zaccardi F, Squire I, Okhai H, Davies M, Huang W, Mamas M, Lam CS, Khunti K, Kadam UT. Risk factors for heart failure: 20-year population-based trends by sex, socioeconomic status, and ethnicity. Circulation: Heart Failure. 2020 Feb;13(2):e006472.
8. Lee DS, Austin PC, Rouleau JL, Liu PP, Naimark D, Tu JV. Predicting mortality among patients hospitalized for heart failure: derivation and validation of a clinical model. Jama. 2003 Nov 19;290(19):2581-7.
9. Krumholz HM, Wang Y, Parent EM, Mockalis J, Petrillo M, Radford MJ. Quality of care for elderly patients hospitalized with heart failure. Archives of Internal Medicine. 1997 Oct 27;157(19):2242-7.
10. de Simone G, Devereux RB, Chinali M, Lee ET, Galloway JM, Barac A, Panza JA, Howard BV. Diabetes and incident heart failure in hypertensive and normotensive participants of the Strong Heart Study. Journal of hypertension. 2010 Feb;28(2):353.
11. Pranata R, Tondas AE, Yonas E, Vania R, Yamin M, Chandra A, Siswanto BB. Differences in clinical characteristics and outcome of de novo heart failure compared to acutely decompensated chronic heart failure–systematic review and meta-analysis. Acta Cardiologica. 2021 Jul 4;76(4):410-20.
12. Choi KH, Choi JO, Jeon ES, Lee GY, Choi DJ, Lee HY, Kim JJ, Chae SC, Baek SH, Kang SM, Yoo BS. Guideline- directed medical therapy for patients with heart failure

with midrange ejection fraction: a patient- pooled analysis from the Kor HF and Kor AHF registries. Journal of the American Heart Association. 2018 Nov 6;7(21):e009806.

13. Degoricija V, Trbušić M, Potočnjak I, Radulović B, Terešak SD, Pregartner G, Berghold A, Tiran B, Frank S. Acute heart failure developed as worsening of chronic heart failure is associated with increased mortality compared to de novo cases. Scientific reports. 2018 Jun 25;8(1):1-6.
14. AlHabib KF, Kashour T, Elasfar AA, Alfaleh H, Hersi A, Alshamiri M, Alshaer F, Mimish L, Almasood A, AlHabeeb W, AlGhamdi S. Long-term mortality rates in acute de novo versus acute-on-chronic heart failure: from the heart function assessment registry trial in Saudi Arabia. Angiology. 2015 Oct;66(9):837-44.
15. Younis A, Mulla W, Goldkorn R, Klempfner R, Peled Y, Arad M, Freimark D, Goldenberg I. Differences in mortality of new-onset (de-novo) acute heart failure versus acute decompensated chronic heart failure. The American Journal of Cardiology. 2019 Aug 15;124(4):554-9.