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Original Research Article

Clinical and etiological profile of heart failure

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ABSTRACT

Background: The overall prevalence of heart failure (HF) is thought to be increasing, in part because current therapies for cardiac disorders such as myocardial infarction (MI), valvular heart disease and arrhythmias, are allowing patients to survive longer. Aims of the study were to know the presentation, causes, outcome of HF patients and to know the proportion of patients with heart failure with preserved ejection fraction (HFpEF) and heart failure with reduced ejection fraction (HFrEF).
Methods: This was a cross-sectional observational study of heart failure patients for duration of one year, admitted in medicine department of medical college and SSG hospital, Vadodara, Gujarat, India.
Results: Males constituted more than half of patients; however, HFpEF was more common in females in all age groups. Majority of patients had HFrEF. Breathlessness was the common presenting symptom. Common aetiologies found were ischaemic heart disease (IHD), hypertension (HTN), diabetes mellitus (DM) and valvular heart disease. 50-64 year patients constituted the major age group. IHD and DM were more common in this age group. Rheumatic heart disease (RHD) was seen commonly in 20-34 year of age group. In-hospital mortality rate though low has not much changed and contributes significantly considering the prevalence.
Conclusions: Like developing countries, IHD contributes a major portion of patients with HF with risk factors like DM and HTN. Though, the contribution from RHD still cannot be ignored. There is little decrease in mortality but considering prevalence the burden is still high.

Keywords: Diabetes mellitus, Heart failure, Ischaemic Heart Disease/ Coronary Artery Disease, Hypertension

INTRODUCTION

The current American college of cardiology foundation (ACCF)/ American Heart Association (AHA) guidelines define HF as a complex clinical syndrome that results from structural or functional impairment of ventricular filling or ejection of blood, which in turn leads to cardinal clinical symptoms of dyspnoea and fatigue and signs of HF, namely oedema and rales. Because many patients present without signs or symptoms of volume overload, the term "heart failure" is preferred over the older term "congestive heart failure".[1]

HF comprises of the wide range of patients from those with normal LVEF (left ventricular ejection fraction) [typically considered as >=50%, heart failure with preserved ejection fraction (HFpEF)], to those with reduced ejection fraction [<=40%, heart failure with reduced ejection fraction HFrEF]. Patients with an LVEF in the range of 40-49%, represent a grey area which is now defined as HFmrEF (heart failure with mid-range ejection fraction).[2]

Differentiation of patients with HF based on LVEF is important due to different underlying aetiologies,

demographics, comorbidities and response to therapies.[3] Most clinical trials published after 1990 selected patients based on LVEF, and in patients only with HFrEF that therapies have been shown to reduce both morbidity and mortality.

Rheumatic Heart Disease (RHD) remains major cause of Heart Failure (HF) in Africa and Asia, especially in young. As developing nations undergo socioeconomic development, the epidemiology of HF is becoming similar to that of western Europe and North America with Coronary Artery Disease (CAD) emerging as a single most cause of HF.[1] Moreover with improved treatment and interventions age-adjusted mortality rates for CAD has declined.[4] As per the data available, an estimation of the prevalence of heart failure in India due to coronary artery disease, hypertension, obesity, diabetes and rheumatic heart disease range from 1.3 to 4.6 million.[5]

The purpose of our study is to know presentation, causes and outcome of HF patients in this hospital i.e. current trend of aetiologies after such changing epidemiology and to know the proportion of HF patients with preserved ejection fraction (HFpEF) and reduced ejection fraction (HFrEF).

Aims and objectives of the studies were to know the presentation, causes, outcome of HF patients and to know the proportion of patients with heart failure with preserved ejection fraction (HFpEF) and heart failure with reduced ejection fraction (HFrEF).

METHODS

A cross-sectional observational study was done for one-year duration comprising patients admitted in medical ward and cardiac ICU of SSG hospital, fulfilling inclusion and exclusion criteria.

Inclusion criteria

All the classical cases of heart failure above the age of 18 years according to Framingham criteria with right sided or left sided independently or in combination (biventricular failure) are included. Right-sided failure symptoms and signs include exertional dyspnoea, pedal oedema, raised JVP, cardiomegaly, RV S3 gallop, hepatomegaly, ascites. Left-sided failure symptoms and signs include paroxysmal nocturnal dyspnoea, orthopnoea, chest pain, cough, cyanosis, pallor, cardiomegaly, dyskinetic apex, LV S3 gallop, basal crepitation.

Exclusion criteria

Patients below the age of 18 years and already diagnosed cases of congenital heart disease were excluded from this study.

After taking written and informed consent about enrolment in the study and maintaining adequate privacy and confidentiality, all patients were subjected to a standardized interview. Detailed medical history was taken, and complete general and systemic examinations were done to establish the diagnosis of heart failure and rule out close differentials like renal failure and acute respiratory distress syndrome.

Complete hemogram, urine routine analysis, renal function test (s. urea, s. creatinine), liver function test (s. bilirubin), serum electrolytes (S. Na+, S. K+) (as an when required), electrocardiogram, chest x-ray, 2d echocardiography, random blood sugar, serum lipid profile, other investigations (as an when required) were done. Whenever needed significance was calculated using chi-square test using medcalc software. A p value of <0.05 was considered significant.

RESULTS

Patients in age group 20-34 years constituted 14.28%, 35-49 year constituted 16.66%, 50-64 years constituted 41.67%, 65-79 year constituted 19.05% and >79 years 7.14%. Maximum patients were in the age group on 50-64 years (Figure 1).

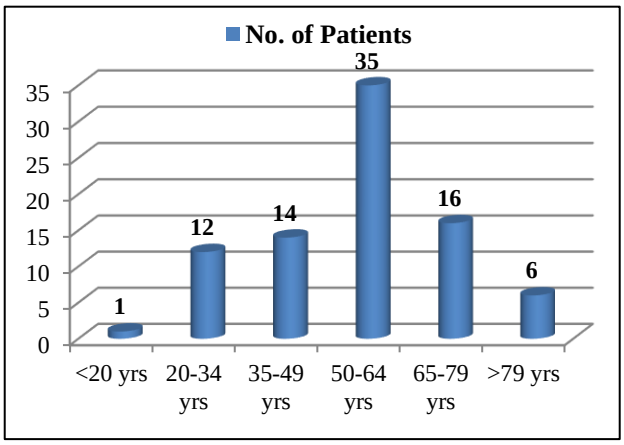

Figure 1: Age distribution.

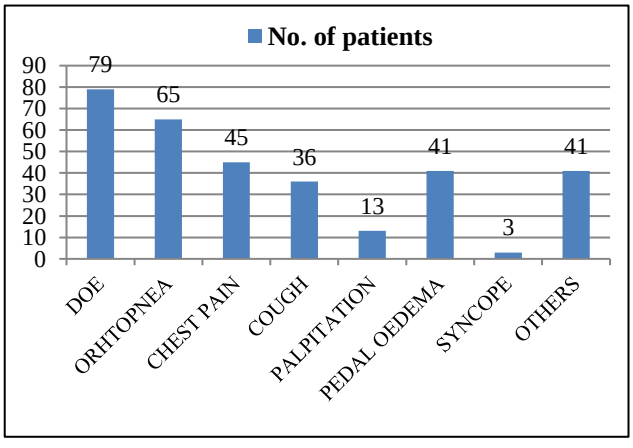

Figure 2: Symptoms in patients of heart failure.

In this study according to gender distribution 58.33% were males and 41.66% were females. (male: female ratio of 1.4:1). Thus, heart failure is more common in males.

In this study, dyspnoea on exertion was the most common symptom followed by orthopnoea, pedal oedema, chest pain, cough, palpitation. Other symptoms like anorexia, nausea, oliguria etc. were also commonly associated. (Figure 2).

Though in this study majority of the patients had normal BMI, patient with ischaemic heart disease tended to have higher BMI and those with rheumatic heart disease tended to have lower BMI i.e. 20.48% were overweight and 6.02% were obese in IHD patients, whereas in non IHD patients only 6.02% were overweight and no one was obese. Thus, as the BMI increased the risk of getting IHD increased. (chi- square value=10.420; level of significance p=0.0055 calculated considering presence of IHD in patients with low, normal and more than normal BMI) (Table 1).

Table 1: BMI.

BMI	Total no. of patients		No. of patients			
			With IHD		Without IHD	
<19 (underweight)	19	22.61 %	7	8.43%	12	14.56 %
19-24.99 (normal)	37	44.04 %	26	31.32 %	11	13.25 %
25-29.99 (overweight)	22	26.19 %	17	20.48 %	5	6.02%
>30 (obese)	5	5.95%	5	6.02%	0	0%
Not recorded	1	1.19%				
Total	84					

Table 2: Vitals.

Vital signs		No. of patients	% of patients
Pulse rate	Normal	32	38.09
	Tachycardia	52	61.90
Respiratory rate	Normal	16	19.05
	Tachypnoea	68	80.95
Blood pressure	Normal	42	50
	Hypertension	14	16.66
	Hypotension	28	33.33
JVP	Normal	24	28.57
	Raised	60	71.43

Vitally, 61.9% of patients had tachycardia (38.09% of patients had normal heart rate), 80.95% of patients had tachypnea (19.05% had normal respiratory rate), 71.43% of patients had raised JVP (with a normal JVP in 28.5%). About 50% of patients had normal blood pressure on admission, 16.66% had hypertension and 33.33% had hypotension. Thus, some kind of vital instability was present in most of the patients. Majority of patients had tachypnoea, raised JVP and tachycardia (Table 2).

Systemic examination

In cardiovascular system (CVS) examination on auscultation most patients had normal heart sounds, only 5.95% of patients had muffled heart sounds. 30.95% of patients had murmur and 4% of patients had other finding like gallop or other added or abnormal sound suggestive of underlying disease. Thus only 39.5% had an abnormal auscultation in CVS. Commonest being murmur.

In respiratory system examination on auscultation, majority (79.76%) had crepitations, 19.04% of patients had rhonchi and 11.9% of patients had decreased breath sounds. 13.09% of patients had no significant abnormal breath sounds or added sounds.

On per abdomen examination, majority (38.09%) of patients had palpable liver, 10.71% of patients had demonstrable evidence of free fluid in abdomen. 55.95% of patients had grossly normal abdominal examination.

Blood investigations

According to blood investigations 52.38% of patients had normal haemoglobin (Hb >11gm%). Rest 47.61% had anaemia (Hb <11gm%). Out of which 4.76% had severe anaemia (Hb <6gm%), 7.14% had moderate anaemia (Hb 6-9gm%) and 35.71% had mild anemia (9-11gm%). About 52.38% of patients had high total count (>11,000/microliter) and 47.62% had normal total count (4000-11000/microliter). Regarding liver and renal function test 50% of patients had normal S. creatinine and 50% had S. creatinine >=1.2mg/dl. 58.33% of patients had normal bilirubin and 41.67% had S. bilirubin >1.2 gm/dl. High total count was a common finding.

On ECG, 73.3% of patients had normal sinus rhythm and 22.6% of patients had arrhythmias. 55.95% of patients had normal axis, 44.05% had abnormal axis of which left axis deviation was present in 23.8% of patients and right axis deviation was present in 20.23% of patients. Some kind of chamber enlargement was present in 19.05% of patients. 80.95% of patients had no evidence of any chamber enlargement. 23.8% of ECG was not showing any kind of ischaemic changes. Out of rest 76.2% of patients, majority (44.04%) of patients had ST depression with T inversion, 16.66% had ST elevation, 10.71% had LBBB (left bundle branch block) and 16.66% had poor R wave progression. Most of the patients had some kind of ischaemic changes (Table 3).

Chest X-ray PA view (CXR)

Patients showing cardiomegaly, pulmonary oedema and pleural effusion are as shown in Table 4. Few patients

4.76% had other finding on CXR related to underlying disease like COPD, straightening of left heart border in mitral stenosis etc. 1.19% of patients had normal CXR (Table 4).

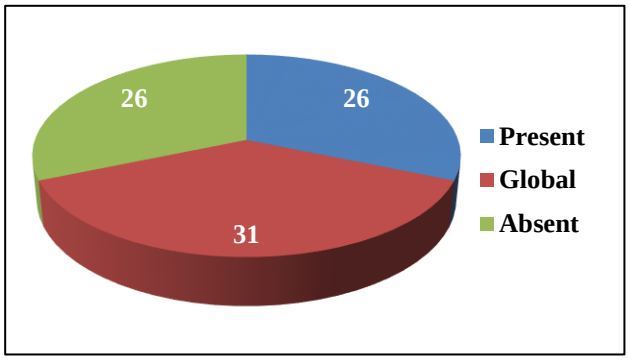

Figure 3: Wall motion abnormalities in 2D Echo.

The 2D ECHO - Heart failure with preserved and reduced ejection fraction (gender distribution)

If patients with EF 50% or more is considered to have HFpEF and those with 40% or less EF are considered to have HFrEF, then in this study, majority of patients had HFrEF (71.15%). Regarding gender distribution, in this study, HFpEF was commoner in female (60% of HFpEF patients were females, p=0.027) and HFrEF was commoner in male (71.15% of HFrEF patients were male, p=0.0025) (Table 5).

Table 3: ECG changes.

ECG	Criteria	No. of patients	% of patients
Rhythm	Sinus	62	73.8
	Arrhythmia	22	26.2
Axis	Normal	47	55.95
	Left	20	23.8
	Right	17	20.23
Chamber hypertrophy	Present	16	19.05
	Absent	68	80.95
Ischaemia	Absent	20	23.80
	Present	64	76.1
Ischaemic changes	T inversions/ ST depression	37	44.04
	ST elevation	14	16.66
	LBBB	9	10.71
	Poor R wave progression	14	16.66

Table 4: Chest X-ray changes.

CXR findings	Cardiomegaly	Pulmonary oedema	Pleural effusion	Others
Present	76	50	10	4
Absent	8	34	74	80
Total	84	84	84	84

Table 5: HFpEF and HFrEF: gender distribution.

HF	Male	Female	Total	% of patients	Chi squared value	Level of significance
HFpEF	10 (40%)	15 (60%)	25	32.47	4.863	p=0.0274
HFrEF	37 (71.15%)	15 (28.84%)	52	67.53	9.121	p=0.0025
Total	47	30	77	100		

Table 6: Valvular lesion in 2D Echo.

Valvular lesion	No. of patients	% of patients
Degenerative changes	11	13.25
Rheumatic affection	15	18.02
Normal morphology	57	68.67
Total	83	100

Other findings in 2D ECHO

In 2D echo regional wall motion abnormality (RWMA) was present in 31.32% of patients, 37.35% of patients had global hypokinesia. Rest 31.32% of patient had no wall motion abnormality. Thus, most of the patients had global hypokinesia. (one patient expired on admission and 2D ECHO of that patient was not available) (Figure 3).

Most of the patients 68.67% had normal valves on 2D ECHO. Out the valves affected, 18.02% had rheumatic affection and 13.25% had degenerative changes. Thus, most of the patients had normal valves, though rheumatic and degenerative changes were present in many (Table 6).

In rheumatic valves, majority had predominant MS (mitral stenosis) (73.33%), followed by 13.33% had MR (mitral regurgitation). MS with AS (aortic stenosis) was present in 6.66% of patients and AS was present in 6.66% of patients. In patient with mitral stenosis 7 out of 11 were females. In aortic stenosis with or without mitral

stenosis was present in males in my study. Thus, mitral stenosis was most common lesion and females were predominantly involved (Table 7).

Table 7: Types of rheumatic valvular lesions.

Rheumatic lesion	Female	Male	Total	% of patients
MS	7	4	11	73.33
MR	1	1	2	13.33
MS+AS	0	1	1	6.66
AS	0	1	1	6.66
Total	8	7	15	

In this study diastolic dysfunction was present in 30.95% of patients. Majority (87.95%) of patients had some kind of regurgitation noted on echocardiography. 69.88% of patients had some amount of pulmonary arterial hypertension. Approximately half of the patients had evidence of any of the chamber enlargement on echocardiography, left ventricle being the most common (61.9%), followed by left atrium (55.95%), right atrium (50%) and right ventricle (44.04%). Thus, pulmonary hypertension was present in 69.88% of patients. Most of the patients had some evidence of regurgitation.

Analysing the aetiology; 64.28% had IHD, 22.62% had hypertension, 20.24% had DM and 17.86% had RHD. Other aetiologies constituted 26.19% of patients. Other causes were peripartum females (7.14%), anaemia (4.76%), hyperthyroidism (3.57%), hypothyroidism (2.38%), COR pulmonale (3.57%), and connective tissue disease (2.38%). Most of the patients had multiple aetiologies contributing to heart failure. Cor pulmonale was found secondary to COPD as well as lung involvement secondary to connective tissue disease. In connective tissue diseases, both dilated cardiomyopathy (DCM) and COR pulmonale was observed. Thus, commonest aetiology is IHD followed by HTN, DM and RHD (Figure 4).

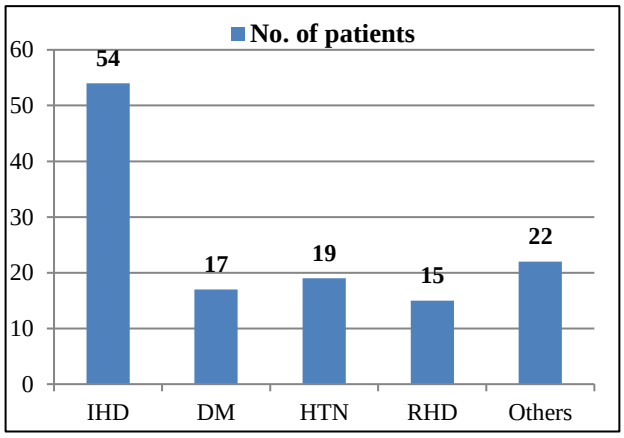

Figure 4: Aetiology of HF.

Amongst 54 IHD patients males were twice than females. Peripartum were obviously females. For other etiologies either the sample size is small to comment upon or the difference is small to comment upon. Still overall impression suggest that IHD, DM and HTN were seen more in males, whereas RHD, thyroid and connective tissue disease and anaemia were common in females. (out of 4 patients with anaemia 3 were females, 2 out of 3 hyperthyroid and both the hypothyroid patients were females, both the patients with CTD were females) (Table 8).

Table 8: Aetiology of HF: gender distribution.

Disease	Female	% female	Male	%male	Total	% of patients	Chi^2 value	Level of significance
IHD	18	21.43	36	42.86	54	64.28	4.269	p=0.038
DM	6	7.14	11	13.09	17	20.24	0.352	p=0.553
HTN	9	10.71	10	11.90	19	22.62	0.325	p=0.568
RHD	8	9.52	7	8.33	15	17.86	1.010	p=0.314

Table 9: Aetiology of HF: age distribution.

Diagnosis	<20yrs	20-34yrs	35-49yrs	50-64yrs	65-79yrs	>79yrs	Total
IHD	0	0	8	29	12	5	54
HTN	0	0	3	9	6	1	19
DM	0	0	2	8	5	2	17
RHD	1	7	5	1	1	0	15

Maximum patients of IHD, HTN and DM were found in 50-64 years of age group (75.93% of patients of IHD, 78.95% of HTN, 76.47% of DM were in 50-79 year of age group.) RHD was common in 20-34 yrs. of age group, however it was found in all ages (Table 9). For

other aetiologies number of patients were small to comment upon, however all CTD patients were young (20-34 yrs.) and hypothyroid were old (above 59 years). Thus, IHD, DM, and HTN were common in 50-64 years of age. RHD, CTD were common in 20-34 years of age group. 20-34 years being reproductive age of females had all the peripartum patients.

Duration of stay

In this study patient had an average stay of 7 days with 55.95% of patients staying for 4 to 8 days, 17.86% of patients stayed for 1-4 days, 16.67% of patients stayed for 8 to 12 day and rest of 9.52% of patients stayed for 12-16 days. Thus, majority of the patients stayed for 4 to 8 days.

Patient outcome

Out of 84 patients, 72 were discharged, 8 took discharge against medical advice and 4 patients expired. In hospital mortality was 5.26% (excluding DAMA).

DISCUSSION

In this study, maximum patients were in the age group on 50-64 years. Based on national health and nutrition survey in the United States; the prevalence of heart failure rises with age from 1% in aged 25 years to 54 years to 4.5% at 65-74 years. It is probably related to 10% in >75 years.[6] As per the study by Kannel et al, in Framingham study, an incident of CHF doubles with each decade of age with only slight male preponderance. Thus, maximum incidence of HF is in 85-94years of age.[7] In Hillington study by Cowrie et al, also incidence increases from 0.02/1000 population per year in those aged 25-40 years to 11.6/1000 population in those aged 85 years and above but the median age at presentation was 76 years.[8]

In this study male: female ratio is 1.4:1. In Framingham study by Kannel et al, also there was a slight male preponderance in every age group.[7] Hillington study by Cowie et al, also had a male: female incidence ratio of 1.75.[8] In this study, most (94%) patients presented with breathlessness. According to Framingham study, commonest symptom was orthopnoea (48%) (Figure 2).[7]

According to Body Mass Index (BMI), 22.61% of patients were undernourished, 44.04% were normal, 26.19% were overweight and 5.95% were obese. Thus, majority of patients in this study were normally nourished. Though in this study most of the patients had normal BMI, patient with ischaemic heart disease tended to have higher BMI and those with rheumatic heart disease tended to have lower BMI i.e. 20.48% were overweight and 6.02% were obese in IHD patients, whereas in non-IHD patients only 6.02% were overweight and no one was obese. Thus, in this study with BMI increase the risk of getting IHD increased (p=0.005). This is in concordance with Framingham study which showed obesity is a risk factor for cardiac failure particularly in women both directly as well as by promoting hypertension, insulin resistance, left ventricular hypertrophy and promoting dyslipidaemia (Table 1).[7]

In this study, the majority 67.53% of patients had HFrEF and 32.47% had HFpEF. In HFpEF 60% were females and 40% were males whereas in HFrEF 71.15% were males and 28.84% were females. Thus, in this study, HFrEF was more common in males and HFpEF more frequent in females. In a study by Bhatia et al, 31% of patients had HFpEF comparable to our study.[9] However, in study by Bursi et al, HFpEF was present in 55% of patients.[10] In this study also HFpEF was commoner in female (60%, p=0.027) and HFrEF was commoner in male (71.15%, p=0.0025) (Table 5). This study and above studies reaffirm the fact that HFpEF patients are more likely to be female in contrast to the observation that HF is more common in male.[9,10]

In rheumatic valves, the majority had predominant MS (mitral stenosis) (73.33%), followed by 13.33% had MR (mitral regurgitation). MS with AS (aortic stenosis) was present in 6.66% of patients and AS was present in 6.66% of patients. Inpatient with mitral stenosis 7 out of 11 were females. In aortic stenosis with or without mitral stenosis was present in males in my study. Thus, mitral stenosis was most common lesion and females were predominantly involved. These results are like the study by Manjunath et al, where RHD contributed most to the valvular heart disease with calcific degeneration (commonest cause of isolated AS), myxomatous disease and bi-aortic valve being the other major forms. In RHD order of involvement of valves was mitral (60.2%), followed by aortic, tricuspid and pulmonary valves (Table 7).[11]

Analysing the aetiology; 64.28% had IHD, 22.62% had hypertension, 20.24% had DM and 17.86% had RHD. Other aetiologies constituted 26.19% of patients. Other causes were peripartum females (7.14%), anaemia (4.76%), hyperthyroidism (3.57%), hypothyroidism (2.38%), COR pulmonale (3.57%), and connective tissue disease (2.38%). Most of the patients had multiple aetiologies contributing to heart failure. Cor pulmonale was found secondary to COPD as well as lung involvement secondary to connective tissue disease. In connective tissue diseases, both dilated cardiomyopathy (DCM) and COR pulmonale were observed. Thus, commonest aetiology is IHD followed by HTN, DM and RHD (Figure 4). In Framingham study, the coronary disease seems to account for about half of the case of cardiac failure depending on age and sex. Coronary disease, hypertension and diabetes alone or in combination predominate as causes of heart failure. 87% of HF in population was attributed to coronary artery disease and hypertension. Coronary disease and diabetes are increasingly responsible for HF in recent years. Hypertension and valvular heart disease are diminishing

determinants.[7] In this study also CAD, DM and HTN were the major causes of HF. In Hillingdon study by Cowrie et al, primary aetiologies were coronary heart disease (36%), hypertension (14%) and valve disease (7%) with 34% unknown and 10% other aetiologies.[8] In a study by Fox et al coronary artery disease was an aetiological factor in 52% of cases.[12] In a study by Patel et al, primary aetiologies were coronary artery disease (50%), dilated cardiomyopathy (17%), hypertension (14%) and RHD (7%), anaemia (7%), COR pulmonale (3%) and others (2%).[13]

Out of 84 patients, 72 were discharged, 8 took discharge against medical advice and 4 patients expired. In-hospital mortality was 5.26% (excluding DAMA). According to Framingham study death rates in hospitals were 7-10%.[7]

CONCLUSION

Heart failure was seen commonly in age group of 50-64 years as IHD was the leading cause. Though males were most commonly affected, HFpEF was commoner in females. The proportion of HFrEF was considerably more.

IHD has become the leading cause of HF (64.28%) followed by HTN (22.62%) and DM (20.24%) similar to the developed nations and were predominantly found in 50-64 years of age group moreover IHD was common in males. However, RHD still contributes significantly constituting 17.86% and predominantly found in young females, though patients were found in all age groups. Other aetiologies (26.19%) which contributed singly or with other aetiologies found were peripartum cardiomyopathy, anaemia, hyperthyroidism, hypothyroidism and COR pulmonale.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee of Human Research (IECHR), Medical college and SSG Hospital, Baroda, Gujarat, India

REFERENCES

1. Heart failure. Pathophysiology and diagnosis by Douglas L. Mann, Murali Chakinala. Harrison's Principles of Internal Medicine. 19th Ed. 2015:1507-1516.
2. Ponikowski P, Voors AA, Anker AD. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC). Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. Euro Heart J. 2016;37(27): 2129-200.
3. Butler J, Fonarow GC, Zile MR, Lam CS, Roessig L, Schelbert EB, et al. Developing therapies for heart failure with preserved ejection fraction: current state and future directions. JACC: Heart Failure. 2014 Apr 1;2(2):97-112.
4. Approach to the patient with possible cardiovascular disease. Joseph Loscalzo. Harrison's Principles of Internal Medicine. 19th Ed.; 2015:1959-1961.
5. Huffman MD, Prabhakaran D. Heart failure: epidemiology and prevention in India. 2010;23(5):283-8.
6. Schocken DD, Arrieta MI, Leaverton PE. Prevalence and mortality rate of congestive heart failure in the United States. T Am Coll Cardiol. 1992;20:301-6.
7. Kannel WB, Ho K, Thom T. Changing epidemiological features of heart failure. Br Heart J. 1994;72:(S 3-9).
8. Cowrie MR, Wood DA. Incidence and aetiology of heart failure. Europ Heart J. 1999;20:421-8.
9. Bhatia RS, Tu JV, Lee DS, Austin PC, Fang J, Haouzi A, et al. Outcome of heart failure with preserved ejection fraction in a population-based study. New Eng J Medi. 2006 Jul 20;355(3):260-9.
10. Bursi F, Weston SA, Redfield MM, Jacobsen SJ, Pakhomov S, Nkomo VT, et al. Systolic and diastolic heart failure in the community. JAMA. 2006 Nov 8;296(18):2209-16.
11. Manjunath CN, Srinivas P, Ravindranath KS, Dhanalakshmi C. Incidence and patterns of valvular heart disease in a tertiary care high-volume cardiac center: a single center experience. Ind Heart J. 2014 May 1;66(3):320-6.
12. Fox KF, Cowie MR, Wood DA, Coats AJ, Gibbs JS, Underwood SR, et al. Coronary artery disease as the cause of incident heart failure in the population. Eur Heart J. 2001 Feb 1;22(3):228-36.
13. Patel SN, Yeshwanth P, Rampure DM. A study on clinical and aetiological profile of heart failure in Mamata General Hospital. Scho J Appli Med Scien. 2014;2(6G):3370-4.

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