

Risk Factors for Decompensation of Heart Failure in Patients with Established Left Ventricular Dysfunction

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ABSTRACT

Objective: This study was aimed to identify the risk factors for decompensation of heart failure in patients with established left ventricular dysfunction.

Study Design: Observational / descriptive / cross-sectional study

Place and Duration of Study: This study was carried out at Sandeman provincial hospital, Quetta from 15th March till 14th September 2015.

Materials and Methods: One hundred fifty patients of decompensated HF with established left ventricular dysfunction (Ejection Fraction <40 %) were included in the study. Information about factors for decompensation of HF was collected from patients through a proforma during their hospital admission. The data was analyzed on statistical package for social sciences (SPSS) version 16.

Results: Out of 150 patients, 59 % had ischemic heart disease while 41 % had non-ischemic heart disease. Non-compliance with diet and/or drug therapy (56.7% and 37.3%, respectively), cardiac arrhythmias (34%), lack of follow-up (26.7%), and intake of medications precipitating heart failure (20%) were the most common risk factors for decompensation of heart failure. Among other significant risk factors were infections (11.3%), anemia (10.7%) and myocardial ischemia (10.7%). Pregnancy (2.7%) and thyroid disorders (2.7%) were less common risk factors.

Conclusion: Majority of the risk factors for decompensation of heart failure appear to be preventable, and should thus be avoided with a better and more comprehensive control of heart failure in these patients.

Key Words: Decompensated heart failure, Systolic dysfunction, Precipitating factors, Ejection fraction, Non-compliance, Ischemic heart disease, Echocardiogram

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INTRODUCTION

Heart failure (HF) is an increasing, global epidemic, particularly in the elderly, that results in significant health care expenditure, frequent readmissions,¹ disability, and mortality. It affects nearly 23 million people worldwide. The prevalence of heart failure rises with age in both men and women and affects 1 to 2 percent² of persons aged 45 to 54 years and up to 6 to 10 percent of people over the age of 65 years.³ This overall increasing prevalence of HF is thought to be due to marked improvement in our current therapies of cardiac disorders,⁴ such as myocardial infarction, valvular heart disease and arrhythmias which allow the patients to survive longer.^{5,6} The age-adjusted incidence

of heart failure appears to have remained stable over the past 20 years. Over the past 50 years, the incidence of heart failure has declined among women but not among men.⁷ Survivals after the onset of heart failure has improved in both sexes⁸ over the last ten years but the mortality rate is still high with approximately 50% of patients are dead at five years.

Heart failure was once thought to arise primarily in the setting of depressed left ventricular (LV) ejection fraction (EF), commonly referred to as systolic failure but today many epidemiological surveys suggest that about half^{9,10} of patients who develop heart failure have a normal or preserved EFb,¹¹ referred to as diastolic failure. The causes of heart failure in patients with preserved systolic function also differ from those with reduced systolic function.¹²⁻¹⁵ In the evaluation of patients with heart failure, it is important to identify not only the underlying cause but also the precipitating factors.¹⁶ Patients with a cardiac abnormality produced by a congenital or acquired lesion such as valvular aortic stenosis or cardiomyopathy may remain asymptomatic or have limited clinical disability for many years.

Thus for management of acute heart failure, every patient must be approached individually according to the aetiology, severity of disease, clinical presentation, presence of coexisting illness and precipitating factors

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in particular. The main goals of treatment for heart failure are to reduce symptoms, prolong survival, improve the quality of life, correct precipitating processes and prevent disease progression. Once patients have developed structural heart disease (stages B through D), the choice of therapy for HF with reduced ejection fraction (EF) depends on their New York Heart Association (NYHA) functional classification. Our knowledge of the epidemiology, pathophysiology and therapy has improved dramatically during the last 20 years.¹⁷ The pharmacological therapy of heart failure comprise of the following categories: diuretics, angiotensin converting enzyme inhibitors (ACEIs), beta blockers, positive inotropic agents and anti-arrhythmic drugs. The routine use of anticoagulants is controversial. Most experts prescribe anticoagulants only to those patients who have embolic episodes or those with atrial fibrillation or patients with severe dilated cardiomyopathy in normal sinus rhythm. Device therapy for HF, including implantable cardioverter defibrillators and cardiac resynchronization therapy, has recently been demonstrated to also result in substantial mortality reduction.¹⁸

The aim of this study was to evaluate the prevalence of these avoidable risk factors in a population of patients, presenting with acute decompensated heart failure who already had known depressed left ventricular systolic function (ejection fraction <40 %).

MATERIALS AND METHODS

This Observational / descriptive / cross-sectional study was conducted in cardiology department, Sandeman Provincial Hospital Quetta over a period of 6 months, from 15th March till 14th September 2015. It was a descriptive and cross-sectional study. Patients all diagnosed cases of decompensated heart failure above the age of 18 years were included. New patients with heart failure without previous history of left ventricular failure, patients having cor pulmonale or pericardial tamponade and those with dementia or severe psychiatric illness were excluded. Patients history regarding precipitating factors e.g. compliance to diet and drugs, infections like respiratory tract infection (RTI) and urinary tract infection (UTI), any history of chest pain, pregnancy, palpitation, intravenous (IV) drip, intake of new drug causing myocardial depression or causing salt and water retention (e.g. calcium channel blockers, non-steroidal anti-inflammatory drugs, steroids and cyclosporine etc.) and regarding symptoms of thyrotoxicosis. Patients were regarded as "dietary non-compliant" if their daily fluid intake was equal to or more than 2.5 litres per day, or if they regularly salted their food at the table, or both. Patients who reported taking their drugs only intermittently or not at all were classified as "medication non-compliant". Set criteria for labelling the contribution of

the known precipitating factors of heart failure were followed in the proforma, filled by the principal investigating physician. Investigations like ECG, X-ray chest, complete blood count, Serum urea/creatinine and electrolytes and thyroid function test when indicated, were carried out. The data was analyzed on SPSS version 16.

RESULTS

The results were analyzed and evaluated on statistical package for social sciences (SPSS) version 12. Out of one hundred and fifty patients of heart failure, 105 patients (70 %) were male and 45 (30%) were female. The mean age was 55.21±13.2 years, ranging from 20 to 80 years. 60 % of the patients were above 50 years of age (Table 1). In this study, 88 patients had heart failure due to ischemic heart disease, making 59 % of the study population, whereas in 62 patients the heart failure was secondary to diseases other than ischemic heart disease, making 41 % of the study population (Table 2). The most dominating risk factors were non-compliance to diet and drugs, found in 85(56.7%) and 56 (37.3%) cases, respectively. Cardiac arrhythmias were observed in 51 (34%) cases and 40 (27%) patients of the study population were lost to follow-up. 30 (20%) patients were observed to be taking drugs for cardiac and non-cardiac diseases, which are known to exacerbate heart failure. These drugs were in the form of non-steroidal anti-inflammatory drugs (NSAIDs), steroids, the non-dihydropyridine calcium channel blockers, cyclosporine and intravenous drips. Infections most commonly of the respiratory and urinary tract, contributed as risk factors in 17 (11%) patients. Myocardial infarction (both Q wave and non-Q wave) and anaemia, each was identified to be the precipitating factor in 16 (11%) patients of the 150 study population. 4 (2.7%) patients were found to have thyroid disorders (both hypo and hyperthyroidism), and the same number of patients developed decompensated heart failure (HF) during pregnancy. Importantly, not a single patient had vaccination against haemophilus influenza and streptococcus pneumoniae (Table 3). The ejection fraction percent (EF %) showed significant difference with arrhythmias when compared by Student's t-test with P=0.01, t= 2.80. The remaining risk factors showed non-significant results (Table: 4)

Table No.1: Age distribution in heart failure patients (n=150)

Age (years)	No.	%age
20 – 40	22	14.7
41 – 60	80	53.3
61 – 80	48	32.0

Table No.2: Frequency of causes of heart failure (n = 150)

Causes of heart failure	No.	%age
Ischemic	88	59.0
Non-ischemic	62	41.0

Table No.3: Risk factors in heart failure patients (n = 150)

Risk factors	No.	%age
Non-compliance to diet.	85	46.7
Non-compliance to drugs	56	37.3
Arrhythmias	51	34.0
Non compliance to follow-up	40	26.7
Myocardial depression, salt and water retention due to intake of new drug.	20	30
Infections	17	11.3
Myocardial Infarction	16	10.7
Anemia	16	10.7
Thyroid disorders	4	2.7
Pregnancy	4	2.7

Table No.4: Comparison of mean ejection fraction (%) with and without risk factors in heart failure patients

Risk factor	Yes	No	P value
Non-compliance to drugs	27.68±4.76	28.78±4.85	0.18
Non-compliance to diet	27.88±4.84	29.00±4.78	0.16
Infection	27.65±4.00	28.46±4.93	0.52
Myocardial infarction	29.06±3.75	28.28±4.95	0.54
Arrhythmias	26.86±4.79	29.14±4.69	0.01
Myocardial depression, salt and water retention due to intake of new drug.	29.00±4.03	28.21±5.01	0.42
Thyroid disorders	25.00±0.00	28.46±4.86	0.16
Anaemia	26.56±3.97	28.58±4.89	0.11
Pregnancy	26.20±2.50	28.40±4.80	0.37
Lack of follow-up	29.25±4.88	28.05±4.79	0.18

DISCUSSION

In patients with stable chronic heart failure, re-admission with decompensation of heart failure relates to behavioral factors (e.g. non-compliance to diet and/or drugs or other life-style modifications), medical factors (e.g. arrhythmias, infections, ischemia, anaemia, thyroid disorders and lack of vaccination) or socio-economic factors (e.g. failing social support). Though there are a large number of studies evaluating these risk factors internationally, there is currently little information locally about the relative frequency of these precipitating factors for decompensation of heart failure.²

In this descriptive cross-sectional study one hundred and fifty patients suffering from decompensated HF with left ventricular systolic dysfunction (ejection fraction <40 %) were included. The mean age of the patients was 55.21±13.2 years which is in contrast to Formiga et al¹⁹, where mean age was 76.7 years. As was expected, majority of the patients (60%) were above 50 years of age but importantly the incidence of heart failure did not increase with increasing age after 50 years. In this study 70 % patients were male and 30 % female, the predominance of male patients probably representing the high incidence of ischemic heart disease as a cause of HF in this group.

The underlying aetiology for decompensated heart failure in 59% patients was ischemic heart disease where as 41% of the study population had heart failure secondary to non-ischemic heart diseases. This is quite comparable with similar four years data of 192 patients collected by Erk²⁰ in which 67 % patients with systolic heart failure were male and ischemic heart disease was the leading underlying cause. In another recent study by Sarmiento et al²¹ reported that coronary heart disease was the etiological risk factor in 42.8 % cases of heart failure.

This study has certain limitations. The evaluation of risk factors was entirely subjective which limited our accuracy in properly estimating non-compliance to diet and medications. Similarly, sub-clinical hypothyroidism could have been missed because thyroid function tests were not carried out in all patients. Occult infections are difficult to document which can lead to underestimation of infection as a risk factor for decompensation of HF. Proper identification of these risk factors is of crucial importance in the management of decompensated HF.

In the present study non-compliance to diet and/or drug therapy was the leading risk factor for decompensation of HF, being responsible in 56.7 % and 37.3 % of cases, respectively. This is pretty much similar to the data collected in an Indian population by Joshi et al²², where patient non-compliance with diet or drug therapy was observed in 49.6% of study population. Similarly, Hussain et al²³ reported that 44% patients of decompensated heart failure had non-compliance to diet and drugs in a Pakistani population. Schiff et al²⁴ studied non-compliance to medications alone and found that 57% patients reported missing or skipping medication because of various factors, particularly missed outpatient appointments. We concluded that better adherence to diet and drug was the key avoidable risk factor, highlighting the precept that better education of patients is mandatory if we want to minimize the number of hospital admissions for decompensated heart failure.

Arrhythmias contributed as risk factor in 34% cases, matching the number of patients with arrhythmias (35%) in the study of Erk,²⁰ but this was in contrast to 13 % cases observed by Tsuyuki et al²⁵ in their study.

In another study by Nieminen et al²⁶ cardiac arrhythmias accounted in one third of cases as the precipitating factor. We also found that 27% patients in our study were lost to follow-up to their primary physician, an important risk factor that has not been studied much before in a local population. This can also be addressed with better education of patients about the importance of regular follow-up which is proven to prevent re-hospitalization with decompensated heart failure.²⁷ Intake of medications known to precipitate heart failure was a significant modifiable risk factor as it was found in 20% of the cases. This is comparable to the findings of Tsuyuki et al²⁵ but unlike in their study, non-steroidal anti inflammatory drugs were the main drugs reported to be used by patients in this study group.²⁸

Infections, predominantly of the respiratory and urinary tract were documented in 11 % patients which was in accordance with the data from Joshi et al,²² where infections accounted as risk factor in 11.2% cases. This is also quite comparable with the studies of Hussain et al²³, Fonarow et al²⁹ and Opasich et al³⁰ showing 16%, 15.3% and 12% cases, respectively. Because pneumonia is a common precipitating factor and is associated with worse outcomes, every effort should be made to prevent pneumonia in patients with heart failure, including rigorous influenza and pneumococcal vaccination. It was also found that ischemia as a precipitating factor in the form of myocardial infarction (both ST elevated and non-ST elevated) was reported in 11% cases where as Erk²⁰ in his study documented more than twice this number (24%). Risk of ischemia and acute coronary syndrome may be reduced with antiplatelet agents, statin therapy, and, possibly, revascularization in eligible patients. Similar to infections and myocardial infarction, anaemia as a risk factor for decompensated heart failure is comparable in frequency to the study done by Joshi et al²² and Hussain et al²³ who showed this to be responsible for 14.4% and 8% cases, respectively.

Thyroid disorders were more common (3%) than what Ghali et al³¹ reported in their study (1%). We also found that 3% cases had pregnancy as a risk factor for decompensation of a previously stable heart failure with left ventricular dysfunction. This is in accordance with the findings of Hussain et al²³ who found pregnancy as a precipitating factor in 3% cases. In an other local study of slightly different pattern by Irum et al,³² heart failure complicated 4.8 % pregnancies. Importantly, not a single patient in the present study population had received vaccination against haemophilus influenza and streptococcus pneumoniae, highlighting the importance of better education for our patients to prevent these possible precipitants.

When comparison of the prevalence of risk factors between male and female patients was made, it was found that non-compliance to diet and drugs was more

common in male patients and so were arrhythmias and myocardial infarction. This is quite comparable to the findings of Nieminen et al.³³ Intake of drugs precipitating HF was significantly more common in females as compared to male patients, suggesting the increased use of non-steroidal anti inflammatory drugs (NSAIDs) for inflammatory arthropathies by the female patients. This suggests that physicians should educate their patients of heart failure, particularly females about the effects of the commonly used pain relieving pills. Similarly thyroid disorders were more common as risk factors in females, again reflecting their common occurrence in female patients. Males had better follow-up to their primary physicians as compared to female patients. Overall, females had more co morbidities as compared to male patients which are in accordance with a similar study in a European population by Dagues et al.³⁴

The association of mean age, ejection fraction and number of hospitalization with the risk factors did not reveal significant information except arrhythmias, which showed significant difference with the mean ejection fraction (EF) with $P=0.01$ and $t=2.80$. Larger randomized studies with bigger sample volume are recommended to better appreciate the association of these common risk factors with the mean age, ejection fraction and number of hospitalization. Similarly, comparison of these risk factors with the causes of heart failure again did not reveal significant information apart from infections which were significantly more common in patients with non-ischemic heart disease, probably explaining the common occurrence of infections in valvular heart disease.

CONCLUSION

Patients of heart failure are clinically fragile, and a variety of preventable risk factors can lead to decompensation. These precipitating factors may be identified in most patients suffering from an acute episode of decompensated heart failure. The majority of these factors appears to be preventable, and could thus be avoided with a better and more comprehensive control of the heart failure patient. Ensuring that all patients with decompensated heart failure receive vaccination for influenza and pneumococcus might also reduce the incidence of decompensation.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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