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ORIGINAL ARTICLE

Precipitants of Acute Decompensated Heart Failure and their Correlation with the Severity of Decompensation in a Resource Poor Country

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ABSTRACT

Objective: 1. To determine the frequency of various factors (patient related, disease related and physician related), causing immediate precipitation of congestive cardiac failure in a tertiary care hospital. 2. To establish correlation between these variables and severity of decompensated heart failure.

Patients and Methods: This cross-sectional study was carried out over a period of March-August, 2016. All patients admitted to cardiology ward and Coronary Care Unit (CCU) of Pakistan Institute of Medical Sciences during the study period were enrolled in the study using consecutive sampling technique. An arbitrarily predetermined sample size of 115 patients was taken. Precipitants were classified as patient related, disease related and physician related. Data was recorded and analyzed using SPSS version 22. Qualitative variables were reported as percentages and quantitative variables by using mean ± standard deviation. Spearman correlation coefficient was used to determine the correlation between variables and outcome measures.

Results: A total of 115 patients were enrolled in this study. The mean age of the population was 51.13±13.6 years. Among these 38.3% of the population was obese. The patients remained admitted to the hospital for the index episode of decompensation for a mean period of 4.14±1.2 days. Infections were found to be the leading precipitant contributing to 57.6% of all decompensation episodes. This was followed by drug non-compliance (17.4%) and arrhythmias (8.7%). Ischemia was noted in 5.2%. Heart failure severity at presentation was found to correlate significantly with the presence of hypertension (Spearman coefficient 0.62, p-value 0.04), baseline hemoglobin (Spearman coefficient -0.58, p-value 0.03), creatinine levels (Spearman coefficient 0.71, p-value 0.05) and precipitant of heart failure (Spearman coefficient 0.257, p-value 0.007).

Conclusion: A sizeable majority of heart failure hospitalizations can be prevented by inculcating measures directed at effective infection control at community and health care level and educating patients regarding recognition of early signs of infection that may target the most important immediate precipitant for acute decompensated heart failure.

Key words: Correlation, Decompensation, Heart failure, Severity.

Author`s Contribution
[1] *Conception, synthesis, planning of research and manuscript writing*
[2] *Interpretation and discussion*
[3] *Data analysis, interpretation and manuscript writing,* [4] *Active participation in data collection*

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Introduction

Coinciding with diminutive rates of death from coronary artery disease, a parallel rise in mortality from heart failure is being observed, which now has taken over as the leading cause of cardiovascular mortality.[1] Despite the advances in therapeutic options for congestive cardiac failure, decompensations requiring hospitalization or those leading to death are not uncommon.[2] The prevalence rates are also known to increase in an exponential fashion with increasing age; and up-to 10% of the people aged 65 years or more are affected by this illness.[3] It is now the most common cause of hospitalization in people of more than 65 years of age.[4] The diagnosis significantly alters the quality of life and overall survival, with mortality rates being as high as the average mortality rates for the patients with malignancies. One -year survival of patients with NYHA (New York Heart Association) IV heart failure has been documented to be a mere 50%.[5] The socioeconomic impact of this illness is immense and a major share of that is contributed by the in-hospital stay of the patients with heart failure. The US health care facilities encounter over 1 million hospitalizations each year with a primary diagnosis of heart failure [2] and it costs an approximate $34 billion to the country's economy each year.[6] A similar trend has been noted in the developing world like Pakistan where health care facilities continue to be scarce and under equipped, and even when present, a lack of access to health care for majority of the population makes diseases requiring constant medical attention a growing problem. No studies reporting the overall incidence and prevalence of heart failure are present and the burden of this illness is grossly underestimated owing to under reporting and an enormous undiagnosed pool of the heart failure iceberg. One single center study carried out in 2008-2010 reported heart failure as a cause of 22.87% of all hospitalizations with an average hospital stay of 4.97 days. [7] In addition, hospitalization for heart failure is a documented predictor for readmission and death in the post discharge period (20% mortality rate after hospitalization).[8] Readmission rates may range from 27-47% for up-to 6 months following the index discharge.[9,10]

Many clinical and lifestyle factors are postulated to precipitate decompensation of heart failure. These include drug non-compliance, myocardial ischemia, arrhythmias, infection, anemia, alcohol, pregnancy, worsening hypertension, acute valvular insufficiency and use of drugs like calcium antagonists, beta-blockers, NSAIDs, thiazolidinedione, and class I anti-arrhythmic drugs. The impact of these variables on the course of illness may both be transient or permanent. Studies conducted in the affluent world have identified behavioral factors as the primary culprit in altering the clinical course of heart failure adversely; of which non-compliance to sodium restriction is the major contributor.[11] Another study found inadequate medical treatment in the outpatient department as the major factor leading to decompensation.[12] However, suboptimal infection control practices, over prescription of antibiotics and a low level of health education has led to the observation that infections may be the primary and the most common precipitating factors culminating into decompensated heart failure and at times; death, in Pakistan. All of these factors are largely modifiable and a correct identification may prompt the primary care physicians and cardiologists to address these issues systematically, with increased vigilance leading to an improved clinical course and reduced economic impact of heart failure on Pakistan's already failing economy.

Patients and Methods

This cross-sectional study was carried out from March-August, 2016. Sample size was determined through WHO sample size calculator using 95% Confidence interval, 80% power of test and anticipated population proportion 8.1%.[3] Calculated sample size was 115 patients. Patients admitted to cardiology ward and Coronary Care Unit (CCU) of Pakistan Institute of Medical Sciences were enrolled in the study using consecutive sampling. Acute decompensated heart failure was defined as any sudden or gradual onset of symptoms suggestive of heart failure warranting unscheduled OPD visits, emergency room visits or hospital admissions. Patients were considered eligible to enter into the study if they had a previous or current diagnosis of heart failure due to any cause and if the primary admitting diagnosis was acute decompensated heart failure. Patients with severe

psychiatric illnesses, severe dementia, malignancies or patients with an anticipated survival of less than a week were excluded from the study. All patients provided written informed consent. The hospital's ethical review board approved the study. Presenting symptoms and examination findings were noted and NYHA classification for dyspnea at the time of presentation was used to gauge the severity of the index hospital visit. Pertinent lab data were acquired which included ECG, echocardiogram, blood complete picture, renal and liver functions tests, electrolytes, chest X ray and pregnancy test (if applicable). Trained hospital physicians conducted the interview during admission using an objectively structured questionnaire.

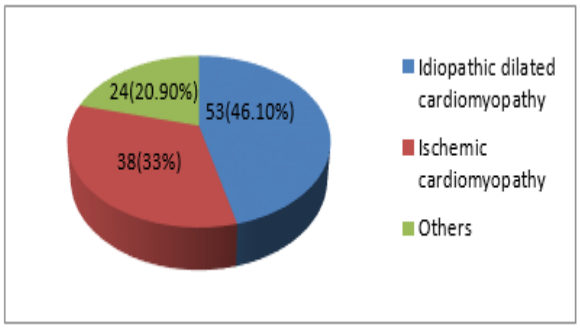

Figure 1: Distribution of study population according to clinical diagnosis (n=115)

Data was recorded and analyzed using SPSS version 22.0. Qualitative variables were reported as percentages and quantitative variables by using mean ± standard deviation. Spearman correlation coefficient was used to determine the correlation between variables and outcome measures. A p-value of <0.05 was considered to be statistically significant.

Results

A total of 115 patients were included in this study after screening for inclusion and exclusion criteria and obtaining written informed consent. The baseline characteristics of this population are described in table 1. The mean age of the population was 51.13±13.6 years. Percentage of obesity was 38.3. Mean hemoglobin was found to be 13.47±2.12 g/dL and the mean creatinine was 1.92±0.99 mg/dL. The patients remained admitted to the hospital for the index episode of decompensation for a mean period of 4.14±1.2 days (maximum 8 days).

Table 1: Baseline characteristics of the study population (n=115)

Parameter	Status	Frequency	Percentage
Hypertension	Non Hypertensive	45	39.1
	Hypertensive	70	60.9
Diabetes	Non Diabetic	63	54.8
	Diabetic	52	45.2
Smoking	No	73	63.5
	Yes	42	36.5
Dyslipidaemia	No	84	73
	Yes	31	27
Lifestyle	Sedentary	53	46.1
	Active	62	53.9
Socioeconomic status	Upper	8	7
	Middle	34	29.6
	Lower	73	63.5

Out of 115, maximum number of patients (n=53) were diagnosed to have idiopathic dilated cardiomyopathy. The distribution of patients according to their clinical diagnosis is as shown in Figure 1. In total 34.8% of the patients had a NYHA III dyspnea at the time of admission and 65.2% had NYHA IV dyspnea at presentation. The patients had an average of 2.14±1.4 admissions over the preceding 6 months for this illness (maximum 6). The trends of precipitants of heart failure that were observed on analysis are shown in table 2.

Table 2: Trends in distribution of immediate precipitants of heart failure decompensation in study participants (n=115)

Immediate precipitant	Number (%)
Respiratory tract infection	46(40)
Urinary Tract infections	11(9.6)
Other infections (e.g. cellulitis)	8(07)
Anaemia	8(07)
Myocardial Ischemia	6(5.2)
Uncontrolled hypertension	6(5.2)
Arrhythmia	10(8.7)
Drug non compliance	20(17.4)

Heart failure severity at presentation was found to correlate significantly with the presence of hypertension, baseline hemoglobin levels, baseline creatinine levels and precipitant of heart failure (Table 3). The number of hospitalizations over preceding 6 months correlated significantly with lifestyle and heart failure precipitant. The length of index hospital stay was also found to correlate significantly with age (Table 3).

Table 3: Correlation of heart failure severity/hospitalization with different variables of study (n=115)

Parameters	Variables	Correlation Coefficient	p-value
Heart failure severity at presentation	Hypertension	0.62	0.04
	Hemoglobin levels	-0.58	0.03
	Creatinine levels	0.71	0.05
	Nature of heart failure precipitant	0.257	0.007
Number of hospitalizations for heart failure over past 6 months	Lifestyle	0.186	0.047
	Nature of heart failure precipitant	0.199	0.033
Length of index hospitalization	Age	0.210	0.022

Discussion

Heart failure represents a growing health related problem globally with more than 20 million people affected world over.[6] An exponential rise in incidence with age has also been reported and this impact is further amplified on account of heart failure being the most common reason for hospitalization in the elderly.[4] All hospitalizations for decompensated heart failure are associated with substantial increase in mortality, morbidity and risk of re-hospitalization as compared to clinically stable heart failure.[13,14] In this light, targeting modifiable precipitants of decompensation may lead to significant improvement in overall mortality, morbidity and quality of life of heart failure patients. The present study was instituted with this aim that may prove to be a stepping stone for enhanced health care delivery for patients affected with heart failure.

The mean patient age in the present cohort was 51.13 years in contrast to a higher mean age of 73.1 years in a similar istudy.[15] This difference may have arisen due to a higher prevalence of post myocarditis dilated cardiomyopathy in our population which tends to affect younger age groups. Majority of patients presented with NYHA IV symptom severity in our study consistent with similar findings noted in another study carried out on a resource rich population.[16] Ninety-nine percent patients had a history of at least one previous hospital admission over the last 6 months comparable albeit higher than a value of 72.6% in the aforementioned study.[16]

The present study identified infection as the major immediate precipitant of decompensated heart failure accounting for 56.6% of all hospitalizations (respiratory infection being the most common one) followed by drug noncompliance, arrhythmia and anaemia. Previous studies carried out in resource rich populations have documented ischemia, drug non-compliance, dietary sodium excess, arrhythmias but no such study except OPTIMIZE-HF identified infection as the major factor, and in that too, it constituted only 15% of total decompensation events in contrast to 55.6% in ours.[15-18] This reflects the role of poor infection control practices in our population along with suboptimal antibiotic prescribing practices giving rise to more frequent and rampant infections. This is also one of the major modifiable factors implicated in heart failure hospitalizations. To the best of our knowledge, correlation of patient and disease related factors with severity of heart failure at presentation, length of hospital stay and number of hospitalization has not been studied previously.

Conclusion

A sizeable majority of heart failure hospitalizations can be prevented by inculcating measures directed at effective infection control at health care level and educating patients regarding recognition of early signs of infection that may target the most important immediate precipitant for acute decompensated heart failure.

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