FREQUENCY OF ETIOLOGICAL AND PRECIPITATING FACTORS IN PATIENTS WITH ACUTE DE-COMPENSATED HEART FAILURE

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Contribution
All the authors contributed significantly to the research that resulted in the submitted manuscript.

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ABSTRACT

Objective: To determine the frequency of etiological and precipitating factors in patients with acute de compensated heart failure (ADHF).

Methodology: This cross sectional descriptive study was carried out at Cardiology Department, from October 2011 to April2012. Patients presented with ADHF were assessed and investigated for the causes and factors that precipitate heart failure (HF).

Results: Out of 291 patients, 153(52.5%) were males. Age ranged from 13-90 years with mean age 53.59 ± 18.98 years. The underlying etiology of HF was coronary artery disease (CAD) 29.2%, hypertension 18.5%, rheumatic heart disease (RHD) 13.7%, dilated cardiomyopathy (DCM) 11.0%, other cardiomyopathies 9%,multiple causes 12.4%, and others 6.1%. Most common precipitating factor for de-compensation was infections (28.2%) followed by poor compliance to medications (17.5%). Other precipitating factors include dietary indiscretion(11%), arrhythmias(13.7%), pregnancy(7.2%) and anemia(5.1%). No precipitating factor was found in 10% patients.

Conclusion: coronary artery disease, Hypertension, rheumatic heart disease and dilated cardiomyopathy are main etiological factors of ADHF. Infections, poor compliance to medications and arrhythmias are major precipitants for ADHF.

Key Words: Etiology, Precipitating factors, Heart failure, ADHF.

INTRODUCTION

Heart failure is a major and growing public health problem in the United States. Approximately 5 million patients in this country have HF, and over 550 000 new cases are diagnosed each year.[1] ADHF is the cause of 5% of acute hospital admissions and the most common cardiovascular cause of hospitalization in the United States.[2] The prevalence of HF is 2-3% and increases with age so thatthe prevalence reaches 10-20% in eighth decade.[3] The number of HF patients has increased despite advances in treatment because of better treatment and improved survival of patients with acute myocardial infarction.1 HF is primarily a condition of the elderly.[4] Approximately 80% of patients hospitalized with HF are more than 65 years old.[5] The outlook is in general, gloomy although some patients can live for many years.[6] Even with the best treatment, ADHF is associated with 10% mortality.[7] HF is the most common hospital discharge diagnosis and more hospital budget is spent for the diagnosis and treatment of this condition than for any other.[8]

HF result from structural or functional cardiac disorders leading to inability to pump enough blood to meet the body requirements.[9]The most common causes of functional deterioration of the heart are damage or loss of heart muscles due to ischemia, increased vascular resistance with hypertension or tachyarrhythmia such as atrial fibrillation (AF).[10] HF is a progressive syndrome andis associated with left ventricular systolic or diastolic dysfunction.[11,12] Moderate or severe diastolic dysfunction is an independent predictor of mortality.[13]HF is usually associated with reduced left ventricular function(HFrEF), with ejection fraction less than 40 %.[14] However approximately half of patients are having preserved left ventricle function with ejection fraction more than 40%. It is called HF with preserved ejection fraction (HFpEF).[15] HFpEF have essentially similar prognosis as compare to HFrEF.[16]

ADHF is a rapid onset or change in the signs and symptoms of HF, resulting in the need for urgent therapy.[2] Symptoms are due to worsening fluid retention or congestion. Dyspnea on minimal exertion, orthopnea, and paroxysmal nocturnal dyspnea usually indicate elevated left sided filling pressures.Similarly abdominal discomfort, early satiety, nausea and vomiting are due to right sided fluid overload.[17]Physical signs includerales, third heart sound,increased intensity of the pulmonary component of the second sound (P2),elevated Jugular venous pressure and peripheral edema.[18] Pulsusalternans generally indicates more severe compromise.[18]Approximately 25% of patients are hypertensive and fewer than 10% are hypotensiveat the time of presentation.[19]

Causes leading to HF vary in distribution and type throughout the world. Whereas CAD is the leading cause of HF in western society, hypertension and RHD play major role in Africa.[19-21]Different studies report CAD and hypertension to be the leading causes of HF.[19,20] Patients with ADHF have a remarkably high prevalence of atrial fibrillation(AF) or flutter, valvular disease and DCM.[22] Diabetes contribute to systolic dysfunction through structural and functional abnormalities of left ventricle.[23] Some patients of idiopathic DCM remains asymptamtic until they present in acute decompensation.[24]

Specific factors that precipitate ADHF include non-compliance with medications or dietary restriction, uncontrolled hypertension, ischemia, arrhythmias, exacerbation of chronic obstructive pulmonary disease(COPD) and respiratory tract infections. Other contributors include non-cardiac conditions such as renal dysfunction, diabetes mellitus, anemia and the side effects of medications (non-steroidal anti-inflammatory drugs, calcium-channel blockers and thiazolidinediones).[25] According to another study, 27% patients had HF caused by either non-compliance to fluid or salt restriction, 14% patients had heart failure symptoms worsened by un-corrected valvular heart diseases or-blockers drugs. Some patients have HF worsened by no apparent reasons.[26]

This study will tell us the frequency of various etiological and precipitating factors of ADHF patients in our setup. It will help us in addressing these factors thereby reducing the frequency of ADHF.

METHODOLOGY

This cross sectional descriptive study was carried out at Cardiology Department, ,Peshawar from October 2011 to April 2012. Sample size was 291 patients based on 37% prevalence of CAD in previous studies with margin of error 5% and estimated1000 patients population for HF per year.

Study protocol was approved from hospital ethical committee. Patients admitted through OPD as well as Accident & Emergency department were included in the study using non probability convenient sampling. Patients of both genders who were above 12 years, presented to Cardiology Unit, in New York Heart Association (NYHA) class IV (ADHF) were eligible for enrolment. Their informed consent was taken. Patients with conditions that mimic ADHF such as COPD with acute exacerbation, patient with acute myocardial infarction complicated by left ventricle failure and patients whose thorough investigations could not be done because of any reason were excluded from the study. Detailed history of fever, drug intake, compliance with medications, pregnancy and compliance with diet and salt intake was taken. Past history of hypertension and diabetes was sought. Previous record with the patient was reviewed. Complete examination including general physical examination and systemic examination was carried out.

Pulse and blood pressure were recorded. Blood pressure

was measured in sitting position using appropriate size cuff after resting the patient for five minutes. Investigations including Electrocardiography (ECG) (Cardiofax machine), echocardiography (Siemens Acoson CV-70 machine) and chest x-ray were done. Hemoglobin and blood cells count, fasting and random blood glucose, blood urea, serum cretanine, serum electrolytes and thyroid function tests were done from hospital laboratory within 24 hours of presentation.ECG and echocardiography were performed on same machine by the same operator to control bias. All the information was recorded on a pre-designed proforma. Following were the operational definitions for this study. CAD: documented coronary artery disease on coronary angiography or history of myocardial infarction or patients on anti-angina therapy. Hypertension: self-reported history of hypertension or the use of anti-hypertensive drugs or documented blood pressure more than 140/80. Diabetes: self-reported history of diabetes or use of anti-diabetic medications or fasting blood sugar 126 or random blood sugar more than 150mg. RHD: documented RHD on previous echocardiography. DCM: dilated left ventricle with end diastolic diameter(LVEDD) more than 55 mm on echocardiography. Other cardiomyopathies: left ventricle dysfunction with reduced ejection fraction with normal LVEDD(55mm). Patient was poor compliant with therapy if he/she missed prescribed drugs consecutively for a week or more time. Dietary indiscretion: usual salt intake without any reductions in its quantity (assessed on history). Anemia: hemoglobin less than 9 mg%.Pregnancy: self-reported history of pregnancy. Arrhytmias include supraventricular tachycardia (SVT), Atrial Fibrillation (AF with FVR), Ventricular Tachycardia(VT).SVT: regular heart rate of more than 100/ minute on ECG. AF with FVR: irregular rhythm with absent P waves on ECG with heart rate more than 100 per minute. VT was diagnosed on ECG with consensus by two cardiologists. Injudicious drug intake: history of use of non-steroidal anti-inflammatory drugs, calcium channel blockers or thiaziadines.

Infections: self-reported history of temperature or documented temperature during hospital stay. Multiple causes were considered when two or more causes were present in a patient. Other causes include all the causes not enlisted. Unknown precipitating factors: no factor is identified despite all the above mentioned investigations. In cases where multiple precipitating factors were present in a patient then the most recently developed factor or alternatively, the most serious factor was taken into account.

The collected data was stored and analyzed in SPSS version 16. Mean + SD was calculated for numerical variables like age. Frequencies and percentages were calculated for categorical variables like gender, CAD, Hypertension, diabetes, cardiomyopathy and various precipitating factors.

RESULTS

Total study population was 291 patients. Out of these, 153(52.5%) were males and 138(47.5%) females. Mean age of the study population was 53.59 ± 18.98 and age range was 13-90 years. The most common cause for HF was CAD which was present in 85 patients (29.2%). Hypertension was the second most common cause for HF and was present in 54(18.5%) patients. RHD was present in 13.7% patients. Multiple causes were present in 36 patients (12.4%).CAD and hypertension was more common in male patients with frequency of 34% and 19.6% respectively. Frequency of RHD and cardiomyopathies were common in female patients with frequency of 18.8% and 13% respectively. Table 1 shows the frequency of various causative factors in HF.

The most common precipitating factor for ADHF was infections which was present in 82 patients (28.2%). Poor compliance with drug therapy was present in 51 patients (17.5%) and dietary indiscretion in 11% patients. No cause was identified in 9.4% patients despite detailed evaluation. Poor compliance to drugs

Table1: Etiology of ADHF

Causes	Overall n=291(%)	Male n=153(%)	Female n=138(%)
Coronary artery disease	85(29.2)	52(34.0)	33(24.0)
Hypertension	54(18.5)	30(19.6)	24(17.3)
Rheumatic heart disease	40(13.7)	14(9.1)	26(18.8)
Dilated cardiomyopathy	32(11.0)	14(9.1)	18(13)
Other cardiomyopathies	26(9)	16(10.4)	10(7.2)
Multiple causes	36(12.4)	20(13.1)	16(11.6)
Others	18(6.1)	7(4.6)	11(8)

Table 2: Precipitating Factors of ADHF

Causes	Overall n=291(%)	Male n=153(%)	Female n=138(%)
Infections	82(28.2)	48(31.4)	34(24.6)
Poor compliance	51(17.5)	30(19.6)	21(15.2)
Dietary indiscretion	32(11.0)	17(11.1)	15(10.8)
Arrhythmias	40(13.7)	16(10.5)	24(17.4)
Injudicious drugs use	23(7.9)	9(5.9)	14(10.4)
Pregnancy	21(7.2)	00	21(7.2)
Anemia	15(5.1)	2(1.3)	13(9.4)
Unknown	27(9.4)	15(9.8)	12(8.7)

and diet were the predominant causes in male patients with frequency of 31.4 %and 19.6% respectively. Arrhythmias and anemia were common in female patients with frequency of 17.4% and 9.4% respectively. Frequency of various precipitating factors is given in Table 2.

DISCUSSION

In this study one part was related to the causes of HF. CAD was the highest cause of HF. Second part was about the factors that precipitate HF(ADHF). Infections and noncompliance to medications were the major precipitants. Our findings are in accordance with international data.

In our study CAD was the leading cause of HF followed by hypertension and rheumatic heart disease. CAD and hypertension are very common in our society. Many patients are not aware of their disease. Compliance is another problem in those who are diagnosed with this condition. Many of these patients end up with HF. Western and African society is different from us in the sense that RHD is very rare in formal and CAD is uncommon in later. As evident by published literature, CAD and hypertension are the leading causes of HF in western society. Framingham Heart Study found that Hypertension and CAD are the most important underlying causes of HF in the United States. According to this study these two factors accounts for >80% of all HF events. Among patients with stage B HF,65% had prior history of hypertension and 49% had Myocardial Infarction.[27] The National Health and Nutrition Evaluation Survey (NHANES) study [28] found that CAD was the cause of >60% of HF patients. Another study observed that CAD was the most frequent underlying disease in HF.[29] In Africa, hypertension, cardiomyopathies and RHD were significant causes for HF. CAD as a cause of HF was present in less than 1% of patients.[21]

The main precipitating factors, in our study, were infections especially lower respiratory tract infections, poor compliance to medications and diet. The study was conducted in cold weather. In addition, high prevalence of cigarette smoking, chronic bronchitis and COPD in male patients was the reason for higher number of respiratory tract infections in our patients. If poor compliance to drugs and diet is taken together then poor compliance becomes the leading factor for de-compensation. RHD was the major cause of HF in female population and pregnancy was the common precipitating factors in young female patients. Our findings are according to other published literature. According to Nieminenet al,[30] main precipitating factors for HF are infections, poor compliance to drugs, arrhythmias and pregnancy. Ghali[31] observed that non-compliance to drugs and diet and arrhythmias were the two major precipitants for de-compensation. Mean age of ADHF in our patients was lower as compared to that reported in international literature. Laura Venskutonyṫe[32] observed that mean age for HF was 67.15 ± 12.5 years. Similarly in a study by Spinaret al,[33] mean age was 71.5 ± 12.4 years. In a local study from Khan et al,[7] mean age of HF patient was 48.5 years which is consistent to our observation. It is evident that patients with ADHF in our setup present at a younger age as compared to western population.

Diseases such as peripartum cardiomyopathy, restrictive cardiomyopathy, hypertropic cardiomyopathy and thyrotoxic cardiomyopathy were uncommon and included under common heading "other cardiomyopathies". Similarly adult congenital heart disease as a causative factor for HF was included in "other causes".Pediatric age group was not included in this study. It is clear from these observations that most causes and precipitants for HF are easily preventable. Addressing CAD patients well on time, controlling hypertension, insisting on patient's compliance to medications, avoiding excessive salt intake and treating infections effectively in HF patients will decrease mortality and frequent hospitalization from this deadly disease.

CONCLUSION

Coronary artery disease, Rheumatic heart disease and

dilated cardiomyopathy are main etiology of heart failure. Multiple risk factors also increase likelihood of heart failure. Infections, poor compliance to medications and arrhythmias are major precipitants for ADHF.

REFERENCES

1. American Heart Association. American Heart Association heart disease and stroke statistics-2005 update. Texas: AHA; 2005.

2. Joseph SM, Cedars AM, Ewald GA, Getlman EM, Mann DL. Acute decompensated heart failure, contemporary medical management. Tex Heart Inst J 2009;36:510-20.

3. Mosterd A, Hoes AW. Clinical epidemiology of heart failure. Heart 2007;93:1137-46.

4. Kannel WB, Belanger AJ. Epidemiology of heart failure. Am Heart J 1991;121:951-7.

5. Masoudi FA, Havranek EP, Krumholz HM. The burden of chronic congestive heart failure in older persons: magnitude and implications for policy and research. Heart Fail Rev 2002;7:9-16.

6. Stewart S, MacIntyre K, Hole DJ, Capewell S, McMurray JJ. More 'malignant' than cancer? Five-year survival following a first admission for heart failure. Euro Heart J 2001;3:315-22.

7. Khan H, Jan H, Hafizullah M. A hospital-based study on causes peculiar to heart failure. J The Univ Heart Ctr 2009;1:25-8.

8. Massie BM, Shah NB. Evolving trends in the epidemiologic factors of heart failure: rationale for preventive strategies and comprehensive disease management. Am Heart J 1997;133:703-12.

9. Neubauer S. The failing heart: an engine out of fuel. N Engl J Med 2007;356:1140-51.

10. McDonagh TA, Morrison CE, Lawrence A, Ford I, Tunstall-Pedoe H, McMurray JJ, et al. Symptomatic and asymptomatic left-ventricular systolic dysfunction in an urban population. Lancet 1997;350:829-33.

11. Lam CS, Lyass A, Kraigher-Krainer E, Massaro JM, Lee DS, Ho JE, et al. Cardiac dysfunction and noncardiac dysfunction as precursors of heart failure with reduced and preserved ejection fraction in the community. Circulation 2011;124:24-30.

12. Ho KK, Anderson KM, Kannel WB, Grossman W, Levy D. Survival after the onset of congestive heart failure in Framingham Heart Study subjects. Circulation 1993;88:107-15.

13. Halley CM, Houghtaling PL, Khalil MK, Thomas JD, Jaber WA. Mortality rate in patients with diastolic dysfunction and normal systolic function. Arch Intern Med 2011;171:1082-7.

14. Ali L, Abid AR, Sheikh SS, Azhar M. Clinical functional class correlation with systolic and diastolic dysfunction in heart failure. Pak Inst Med Sci 2006;2:251-5.

15. How to diagnose diastolic heart failure. European Study Group on Diastolic Heart Failure. Eur Heart J 1998;19:990-1003.

16. 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. N Engl J Med 2006;355:260-9.

17. Nohria A, Tsang SW, Fang JC, Lewis EF, Jarcho JA, Mudge GH, et al. Clinical assessment identifies hemodynamic profiles that predict outcomes in patients admitted with heart failure. J Am Coll Cardiol 2003;41:1797-804.

18. Chakko S, Woska D, Martinez H, de Marchena E, Futterman L, Kessler KM, et al. Clinical, radiographic, and hemodynamic correlations in chronic congestive heart failure: conflicting results may lead to inappropriate care. Am J Med 1991;90:353-9.

19. Fonarow GC, Heywood JT, Heidenreich PA, Lopatin M, Yancy CW. Temporal trends in clinical characteristics, treatments, and outcomes for heart failure hospitalizations, 2002 to 2004: findings from Acute Decompensated Heart Failure National Registry (ADHERE). Am Heart J 2007;153:1021-8.

20. Bourassa MG, Gurne O, Bangdiwala SI, Ghali JK, Young JB, Rousseau M, et al. Natural history and patterns of current practice in heart failure. J Am Coll Cardiol 1993;22:14-9.

21. Onwuchekwa CA, Asekomeh GE. Pattern of heart failure in a Nigerian teaching hospital. Vasc Health Risk Manag 2009;5:745-50.

22. Nieminen MS, Brutsaert D, Dickstein K, Drexler H, Follath F, Harjola VP, et al. EuroHeart Failure Survey II (EHFS II): a survey on hospitalized acute heart failure patients: description of population. Eur Heart J 2006;27:2725-36.

23. Bell DSH. Diabetic cardiomyopathy: a unique entity or a complication of coronary artery disease. Diabetes Care 1995;18:708-14.

24. Redfield MM, Jacobsen SJ, Burnett JC, Mahoney DW, Bailey KR, Rodeheffer RJ. Burden of systolic and diastolic ventricular dysfunction in the community: appreciating the scope of the heart failure epidemic. JAMA 2003;289:194-202.

25. Fonarow GC, Abraham WT, Albert NM, Stough WG, Gheorghiade M, Greenberg BH, et al. Factors

identified as precipitating hospital admissions for heart failure and clinical outcomes: findings from OPTIMIZE-HF. Arch Intern Med 2008;168:847-54.

26. White M, Ducharme A, Ibrahim R, Whittom L, Lavoie J, Guertin MC, et al. Increased systemic inflammation and oxidative stress in patients with worsening congestive heart failure: improvement after short-term inotropic support. Clinical Science 2006;110:483-9.

27. McDonagh TA, Morrison CE, Lawrence A, Ford I, Tunstall-Pedoe H, McMurray JJ, et al. Symptomatic and asymptomatic left-ventricular systolic dysfunction in an urban population. Lancet 1997;350:829-33.

28. Fox KF, Cowie MR, Wood DA, Coats AJ, Gibbs JS, Underwood SR. Coronary artery disease as the cause of incident heart failure in the population. Eur Heart J 2001;22:228-36.

29. Rosolovaa H, Cecha J, Simona J, Spinarb J, Jandovac R, Widimsky´SJ, et al. Short to long term mortality of patients hospitalized with heart failure in the Czech Republic: a report from the EuroHeart Failure Survey. Eur Heart J 2005;7:780-3.

30. Nieminen MS, Harjola VP, Hochadel M, Drexler H, Komajda M, Brutsaert D, et al. Gender related differences in patients presenting with acute heart failure. Results from Euro Heart Failure Survey II. Eur Heart J 2008;10:140-8.

31. Ghali JK, Kadakia S, Cooper R, Ferlinz J. Precipitating factors leading to decompensation of heart failure. Arch Intern Med 1988;148:2013-6.

32. VenskutonytÉ L, MolytÉ I, DÜdonienÉ RA, MizarienÉ V, KavoliÜnienÉ A. Characteristics and management of acute heart failure patients in a single university hospital center. Medicina (Kaunas) 2009;45:855-70.

33. Spinar J, Parenica J, Vitovec J, Widimsky P, Linhart A, Fedorco M, et al. Baseline characteristics and hospital mortality in the Acute Heart Failure Database (AHEAD) main registry. Critical Care 2011;15:291-8.