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Frequency of Major Precipitating Factors in Acute Decompensated Heart Failure Patients

Mishal Zehra[1], Marium Mustaqeem[2*], Ponam Bai3, Shakir Zada[3], Shueeta Kumari[3] and Noor-ul-Hadi[4]

[1]Senior Registrar, Civil Hospital Karachi, DUHS, Pakistan

[2]Consultant Cardiologist, Tabba Heart institute, Pakistan

[3]Interventional Cardiology Fellow, NICVD, Pakistan

[4]Mardan Medical Complex, Bacha Khan Medical College, Pakistan

[*]**Corresponding author:** Marium Mustaqeem, Consultant Cardiologist, Tabba Heart institute, Pakistan

Abstract

Introduction: Acute decompensated heart failure (HF) is a major cause of morbidity and mortality worldwide and its prevalence is even higher in developing countries like Pakistan. It is imperative to identify its precipitating factors to reduce the burden of this disease.

Objective: To determine the frequency of major precipitating factors leading to acute decompensated heart failure.

Materials And methods

Study Design: Cross sectional study.

Settings: Inpatients of cardiology unit of Mardan Medical Complex, Mardan.

Duration of study: Six months from 17-12-2021 to 16-06-2022.

Subject and methods: This study includes 174 patients of acute decompensated heart failure selected by non-probability consecutive sampling technique. All the patients who fulfilled the inclusion criteria were enrolled in the study and a detailed demographic and medical history of comorbidities was taken. The vital signs of each patient were measured followed by evaluation of presenting complaints and duration of heart failure disease. Patients were inquired about major precipitating factors. A complete blood count (CBC), Cardiac troponin I (cTnI) level, hemoglobin A1c (HbA1c), chest x-ray (CXR), electrocardiogram (ECG) and a transthoracic echocardiogram (Echo) of each patient was performed.

Results: Out of 174 patients, male patients were 99 (56.9%) and female patients were 75 (43.1%) with mean age of 60.4 ± 14.2 (30-80) years. Identified precipitating factors were; non-compliance with drugs in 30 (17.2%) patients, non-compliance with diet in 17 (9.8%) patients, non-compliance with fluid in 21 (12.1%) patients, non-compliance with exercise in 63 (36.2%) patients, ischemia in 74 (42.5%) patients, arrhythmias in 48 (27.6%) patients, uncontrolled HTN in 20 (11.5%) patients, uncontrolled DM in 17 (9.8%) patients, anemia in 12 (6.9%) patients and infection in 53 (30.5%) patients.

Conclusion: It was concluded from the study that patient related noncompliance with exercise, drugs, fluid and diet were most common precipitating factors whereas other diseases such as ischemia, infection, arrhythmias, uncontrolled HTN, uncontrolled DM and anemia were also identified as most common precipitating factors leading to acute decompensated heart failure.

Keywords: Acute; Heart failure; Precipitating; Non-compliance; Ischemia

Introduction

Heart failure, also known as Congestive Heart Failure (CHF) is a complex clinical syndrome that results from any functional or structural heart disorder, impairing ventricular filling or ejection of blood to the systemic circulation to meet the systemic needs [1]. It is one of the leading health-related problems of the world significantly associated with morbidity, life-long disability and mortality [2]. Approximately 64.3 million people are living with heart failure worldwide. In developed countries, the prevalence of known heart failure is generally estimated at 1-2% of the general adult population [3]. Heart failure is also an important health problem in Asia, and its prevalence seems to be even higher compared to Western countries, ranging between 1.3-6.7% [4]. Heart failure situation in Pakistan is no better with increasing prevalence and hospitalizations due to heart failure [5,6]. Acute Decompensated Heart

Failure (ADHF), also known as acute heart failure is a fatal syndrome defined as new or worsening symptoms and signs of heart failure and is the most frequent cause of unplanned hospital admissions in patients aged > 65 years [7,8]. In acute decompensated heart failure, patients are predominantly male with mean age of > 70 years. Approximately 66–75% patients have history of heart failure and high burden of comorbidities such as diabetes mellitus 40% and chronic obstructive pulmonary disease 20%. Acute decompensated heart failure accounts for 60–70% of hospitalizations and in-hospital mortality ranges from 4-7% with a median length of stay between 4-11 days [9,10]. The assessment and prevention of factors that precipitate decompensation are therefore an important objective in the care and management of acute decompensated heart failure patients [11-13]. A study by Adhikari S, et al. conducted on precipitating factors leading to decompensation of heart failure, reported the poor compliance with medications, diet and fluid intake in 38.6% patients as most reported precipitating factor followed by arrhythmia 35.6%, infection 12.9%, anemia 4.9% and ischemia 2.9% [12]. Another study by Kaler GP, et al. [13] on precipitating factors leading to decompensation of heart failure reported anemia in 63.8% patients as most reported precipitating factor followed by myocardial ischemia 47.3%, dietary indiscretion 45.3%, valvular dysfunction 42.7%, infections 35.3%. Iatrogenic drugs 28%, non-compliance to treatment 18.7%.

Material and Methods

Setting: The study was conducted on inpatients of cardiology unit of Mardan Medical Complex, Mardan.

Duration of Study: Six months from 17-12-2021 to 16-06-2022.

Study Design: Cross sectional study.

Sample Size: The sample size calculation was done using the WHO software for "Sample size calculation" with the following assumption: Confidence level 95%, Anticipated proportion of ischemia 2.9% [12], margin of error 2.5%. The sample size stands to be n=174.

Sampling Technique: Consecutive sampling.

Sample Selection

Inclusion Criteria: Following patients were included in study; Patients of either gender have ages between 20-80 years. Diagnosed patients of acute decompensated heart failure.

Exclusion Criteria: Following patients were excluded from the study; Patients with dementia or psychiatric illnesses causing problems in communication. Patients under mechanical ventilator or intubated. Patients not willing to participate in study.

Data Collection Procedure: This study was performed after the permission of Research Evaluation Unit (REU) of College of Physicians and Surgeons Pakistan (CPSP) and ethical review committee of the hospital. A written informed consent for the study was obtained from the inpatients who fulfilled the inclusion criteria. Demographic details of each patient including name, gender and age were obtained. Height and weight of each patient was measured by using stadiometer and digital weighing machine. The body mass index of each was calculated with the following formula (BMI=weight/height^2). Vital signs of each patient including fever, heart rate, blood pressure and oxygen saturation were measured by using digital thermometer, digital sphygmomanometer and pulse oximeter respectively. Presenting complaints and duration of heart failure disease was inquired from patient. History of

comorbidities were also inquired from patients including diabetes mellitus, hypertension, hypothyroidism, Coronary Artery Disease (CAD), Chronic Kidney Disease (CKD) and smoking. Each patient was evaluated for different precipitating factors of acute decompensated heart failure. Patients were asked about regular use of medication, use of daily salt consumption, use of daily fluid consumption and routine of daily exercise for confirmation of non-compliance with drugs, diet, fluids and exercise respectively. Other precipitating factors were confirmed by performing Complete Blood Count (CBC), Troponin I level, HbA1c level, Chest X-Ray (CXR), ECG and cardiac echo. Data was recorded in a proforma accordingly by researcher.

Data Analysis Procedure: After collection of data the analysis was conducted by using Statistical Package for Social Science (SPSS) software, Version 25. Mean and standard deviation was calculated for quantitative variables like age (years), height (cm), weight (Kg), BMI (Kg/m^2), fever (°F), heart rate (beats per minute), blood pressure (mmHg), oxygen saturation (%), duration of disease (years), hemoglobin (g/dl), white blood cell count (10^9 / L), neutrophilic leukocytosis (%), troponin T (ng/ml), HbA1c (%), not using drug (days), salt consumption (gm), fluid consumption (liter) and exercise (days). Frequency and percentages were calculated for qualitative variables like gender, age in groups, BMI in groups, disease duration in groups, presenting complaints (chest pain, difficulty in breathing, leg or feet swelling, fatigue and raised JVP), comorbidities (diabetes mellitus, hypertension, hypothyroidism, Coronary Artery Disease (CAD), Chronic Kidney Disease (CKD) and smoking) and outcome i.e., precipitating factors. Precipitating factors were stratified by gender, age in groups, BMI in groups, disease duration in groups and comorbidities (diabetes mellitus, hypertension, hypothyroidism, Coronary Artery Disease (CAD), Chronic Kidney Disease (CKD) and smoking). Post-stratification chi-square test was applied taking p value ≤ 0.05 as significant.

Results

In the current study 174 patients were evaluated for major precipitating factors leading to acute decompensated heart failure. Out of 174, 99 (56.9%) patients were male and 75 (43.1%) were female. Male patients were more affected with the disease as compared to female patients. The enrolled patients age was grouped as; in ≤ 50 years 43 (24.7%) patients and in > 50 years 131 (75.3%) patients. The distribution of duration of disease in groups was done; in this study enrolled patients were grouped as; in ≤ 5 years 59 (33.9%) patients and in > 5 years 115 (66.1%) patients. The major precipitating factors identified in this study were; non-compliance with drugs in 30 (17.2%) patients, non-compliance with diet in 17 (9.8%) patients, non-compliance with fluid in 21 (12.1%) patients, non-compliance with exercise in 63 (36.2%) patients, ischemia in 74 (42.5%) patients, arrhythmias in 48 (27.6%) patients, uncontrolled HTN in 20 (11.5%) patients, uncontrolled DM in 17 (9.8%) patients, anemia in 12 (6.9%) patients and infection in 53 (30.5%) patients **(Table 1).**

Table 1: Distribution of Precipitating Factors (n=174).

Precipitating Factors	Yes (%)	No (%)
Drugs	30 (17.2%)	144 (82.8%)
Diet	17 (9.8%)	157 (90.2%)
Fluid	21 (12.1%)	153 (87.9%)
Exercise	63 (36.2%)	111 (63.8%)
Ischemia	74 (42.5%)	100 (57.5%)
Arrhythmias	48 (27.6%)	126 (72.4%)
Uncontrolled HTN	20 (11.5%)	154 (88.5%)
Uncontrolled DM	17 (9.8%)	157 (90.2%)
Anemia	12 (6.9%)	162 (93.1%)
Infection	53 (30.5%)	121 (69.5%)

The descriptive statistics of continuous variables of precipitating factors was done, where mean and standard deviation of not using drug (in days) was 1.01 ± 1.30 (0-5) days, salt consumption (in gm) was 1.44 ± 1.20 (0-5) gm, fluid consumption (in liter) was 2.05 ± 0.87 (1-5) liter and not doing exercise (in days) was 1.57 ± 1.62 (0-5) days. The mean and standard deviation of age was 60.4 ± 14.2 (30-80) years, height (in m) was 1.57 ± 0.7 (1.35-1.72) m, weight (in Kg) was 83.5 ± 23.5 (39.7-165.0) Kg and BMI (in Kg/m^2) was 27.8 ± 4.7 (18.6-36.3) Kg/m^2. The descriptive statistics of continuous variables of vital signs was done, where mean and standard deviation of fever (in °F) was 99.2 ± 0.9 (97.0-101.5) °F, heart rate (in beats per minute) was 95.5 ± 15.5 (55-125) beats per minute, systolic blood pressure (in mmHg) was 145.0 ± 40.3 (125-180) mmHg, diastolic blood pressure (in mmHg) was 77.5 ± 35.7 (50-105) mmHg and oxygen saturation (in %) was 95.5 ± 15.5 (82-100)%. The descriptive statistics of continuous variable of duration of disease (in years) was done, where mean and standard deviation of duration of disease was 7.7 ± 3.8 (1-13.5) years. The descriptive statistics of continuous variables of laboratory investigation was done, where mean and standard deviation of hemoglobin (in g/dl) was 11.39 ± 3.1 (9.3-12.9) g/dl, white blood cell count (in 10^9 / L) was 8577.0 ± 2980.0 (4900-13900) 10^9 / L, neutrophilic leukocytosis (in %) was 65.5 ± 12.6 (55.7-87.0%), troponin T (in ng/ml) was 0.02 ± 0.001 (0.0-0.03) ng/ml and HbA1c (in %) was 6.75 ± 2.7 (6.1-8.3) %. The distribution of BMI classification was done; in this study enrolled patients were grouped as; in normal weight 43 (24.7%) patients, in overweight 80 (46.0%) patients and in obesity 51 (29.3%) patients. Chest pain was present in 125 (71.7%) patients and absent in 49 (28.3%) patients. Difficulty in breathing was present in 92 (53.1%) patients and absent in 82 (46.9%) patients. The leg or feet swelling was present in 63 (36.1%) patients and absent in 111 (63.9%) patients, fatigue was present in 52 (30.1%) patients and absent in 122 (69.9%) patients, Raised JVP was present in 24 (13.7%) patients and absent in 150 (86.3%) patients. Diabetes mellitus was present in 99 (56.9%) patients and absent in 75 (43.1%) patients. Hypertension was present in 76 (43.7%) patients and absent in 98 (56.3%) patients. Hypothyroidism was present in 13 (7.5%) patients and absent in 161 (92.5%) patients. Coronary artery disease was present in 80 (46.0%) patients and absent in 94 (54.0%) patients. Chronic kidney disease was present in 12 (6.9%) patients and absent in 162 (93.1%) patients. Smoking was present in 59 (33.9%) patients and

absent in 115 (66.1%) patients. The stratification of precipitating factors with respect to gender and disease duration in groups is shown in **Table 2 and 3**.

Table 2: Stratification of Precipitating Factors with Respect to Gender (n=174).

Precipitating Factors	Gender				P-Value
	Male		Female		
	Yes (%)	No (%)	Yes (%)	No (%)	
Drugs	15(15.2)	84(84.8)	15(20.0)	60(80.0)	0.402
Diet	13(13.1)	86(86.9)	4(5.3)	71(94.7)	0.086
Fluid	9(9.1)	90(90.9)	12(16.0)	63(84.0)	0.166
Exercise	39(39.4)	60(60.6)	24(32.0)	51(68.0)	0.315
Ischemia	43(43.4)	56(56.6)	31(41.3)	44(58.7)	0.781
Arrhythmias	27(27.3)	72(72.7)	21(28.0)	54(72.0)	0.915
Uncontrolled HTN	14(14.1)	85(85.9)	6(8.0)	69(92.0)	0.208
Uncontrolled DM	11(11.1)	88(88.9)	6(8.0)	69(92.0)	0.494
Anemia	5(5.1)	94(94.9)	7(9.3)	68(90.7)	0.270
Infection	34(34.3)	65(65.7)	19(25.3)	56(74.7)	0.201

Table 3: Stratification of Precipitating Factors with Respect to Disease in Groups (n=174).

Precipitating Factors	Disease in Groups				P-Value
	≤ 5		> 5		
	Yes (%)	No (%)	Yes (%)	No (%)	
Drugs	9(15.3)	50(84.7)	21(18.3)	94(81.7)	0.619
Diet	6(10.2)	53(89.8)	11(9.6)	104(90.4)	0.899
Fluid	7(11.9)	52(88.1)	14(12.2)	101(87.8)	0.953
Exercise	19(32.2)	40(67.8)	44(38.3)	71(61.7)	0.431
Ischemia	23(39.0)	36(61.0)	51(44.3)	64(55.7)	0.498
Arrhythmias	16(27.1)	43(72.9)	32(27.8)	83(72.2)	0.921
Uncontrolled HTN	8(13.6)	51(86.4)	12(10.4)	103(89.6)	0.541
Uncontrolled DM	10(16.9)	49(83.1)	7(6.1)	108(93.9)	0.022
Anemia	5(8.5)	54(91.5)	7(6.1)	108(93.9)	0.556
Infection	14(23.7)	45(76.3)	39(33.9)	76(66.1)	0.167

Discussion

Acute decompensated heart failure is a growing health problem, and it continues to rise in prevalence and is associated with substantial mortality and morbidity despite advances in the treatment of various risk factors for this condition [14-16]. Locally, very few studies have been performed on the frequency of major precipitating factors in acute decompensated heart failure patients. Therefore, our study was designed at the cardiology unit of Mardan Medical Complex, Mardan for determining the current frequency of major precipitating factors leading to acute decompensated heart failure. Study findings will be helpful in developing strategies to decrease the risk of these precipitating factors and ultimately decrease the risk of acute decompensated heart failure. In current study, 174 patients of acute decompensated heart failure were evaluated, out of which male patients were 99 (56.9%) and female patients were 75 (43.1%). Similar studies reports that male patients were mostly suffering from acute decompensated heart failure such as; Adhikari S, et al. [12] reports the 52.5% of male patients and Kaler GP, et al. [13] reports the 66.0 % of male patients. In current study, mean age of patients was 60.4 ± 14.2 (30-80) years and most of the patients were in age group of > 50 years having 131 (75.3%) patients followed by ≤ 50 years having 43 (24.7%) patients. Similar studies also report the higher mean age of patients such as; Adhikari S, et al. [12] reports the mean age of 62.81 ± 15.92 years and Kaler GP, et al. [13] reports the mean age of 63.3 ± 11.1 years. Similar studies report that adults with increasing age are mostly affected with acute decompensated heart failure. In the current study most reported precipitating factors were distributed into two categories i.e., patient related non-compliance factors and other non-compliance factors that includes presence of diseases other than acute

decompensated heart failure. Most commonly patient related non-compliance factors were; non-compliance with exercise in 63 (36.2%) patients, non-compliance with drugs in 30 (17.2%) patients, non-compliance with fluid in 21 (12.1%) patients and non-compliance with diet in 17 (9.8%) patients. Most reported precipating factor was patient related non-compliance, other factors include presence of ischemia in 74 (42.5%) patients, infection in 53 (30.5 %) patients, arrhythmias in 48 (27.6%) patients, uncontrolled HTN in 20 (11.5%) patients, uncontrolled DM in 17 (9.8%) patients and anemia in 12 (6.9%) patients. Similar studies also report the patient related and other diseases and non-compliance precipitating factors that leads to acute decompensated heart failure such as; Adhikari S, et al. **[12]** reports the poor compliance with medications, diet and fluid intake in 38.6% patients as most reported precipitating factor followed by arrhythmia 35.6%, infection 12.9%, anemia 4.9% and ischemia 2.9%. Another study by Kaler GP, et al. **[13]** reports the anemia in 63.8% patients as the most commonly reported precipitating factor followed by myocardial ischemia 47.3%, dietary indiscretion 45.3%, valvular dysfunction 42.7%, infections 35.3%. iatrogenic drugs 28% and non-compliance to treatment 18.7%. Another study by Diaz A, et al. **[17]** reports the poor compliance with diet in 52% patients and with medications in 30% patients. Others precipitating factors were infections (29%), arrhythmias (25%), acute coronary ischemia (22%), and uncontrolled hypertension (15%), miscellaneous causes were detected in 18 % of the cases (progression of renal disease 60%, anemia 30% and iatrogenic factors 10%). In most of the studies, non-compliance with exercise, drugs, fluid and diet were the most common precipitating factor leading to acute decompensation of heart failure. Next to patient non-compliance was ischemia, infection, arrhythmias, uncontrolled HTN, uncontrolled DM and anemia.

Conclusion

It was concluded from the study that patient related noncompliance with exercise, drugs, fluid and diet are the most common precipitating factors whereas other diseases such as ischemia, infection, arrhythmias, uncontrolled HTN, uncontrolled DM and anemia were also identified as common precipitating factors leading to acute decompensated heart failure. Therefore, steps need to be taken to educate patients regarding non-pharmacological measures in heart failure and ensure enrollment in cardiac rehabilitation programs to improve outcomes.

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