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ORIGINAL ARTICLE

Heart failure in non ST-elevation myocardial infarction (NSTEMI) patients presenting in Faisalabad Institute of Cardiology.

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ABSTRACT… Objective: To determine the frequency of heart failure in non ST-elevation myocardial infraction (NSTEMI) patients presenting in Faisalabad Institute of Cardiology. **Study Design:** Descriptive, Cross Sectional study. **Setting:** Cardiac Emergency, Faisalabad Institute of Cardiology, Faisalabad. **Period:** July 2019 to January 2020. **Results:** A total of 150 patients between 18 to 75 years of either gender admitted with NSTEMI were included. Patients with active cancer or any malignant tumor or autoimmune inflammatory disease, other than NSTEMI, such as STEMI, unstable angina, takotsubo cardiomyopathy and myocarditis, liver and renal failure were excluded. Each patient was assessed by history taking and clinical examination to ensure the diagnosis of heart failure. Smoking, hypertension, dyslipidemia, diabetic, previous history of MI, CABG and pPCI were noted. Age range in this study was from 18 to 75 years with mean age of 44.28 ± 7.70 years. Majority of the patients 88 (58.67%) were between 18 to 45 years of age. Out of the 150 patients, 116 (77.33%) were male and 34 (22.67%) were females with ratio of 3.4:1. Frequency of heart failure in non-ST elevation myocardial infraction (NSTEMI) patients was found in 20 (13.33%) patients. **Conclusion:** This study concluded that there is high frequency of heart failure in non-ST elevation myocardial infraction (NSTEMI) patients.

Key words: Heart Failure, Myocardial Infarction, Non ST Elevation.

INTRODUCTION

Acute coronary syndrome (ACS) refers to a group of signs and symptoms with underlying defect in blood supply of heart that can lead to malfunction of heart muscles leading ultimate to their necrosis.[1] Acute coronary syndrome (ACS) has three modes of presentation including STEMI (30%), NSTEMI (25%), or Unstable angina (38%).[2,3] Patients of ACS present with chest pain which has special character indicative of cardiac origin. It can also be shortness of breath, sweating and nausea. Different types of presentations of ACS can be differentiated through ECG findings.[4] The diagnostic criteria of ACS comprise on the ischemic symptoms like chest pain at rest, ECG changes, and raised cardiac biomarkers, of which cardiac troponin is the most important.[5]

Any form of acute coronary syndrome effects myocardial blood supply. Myocardium need to be viable with patent blood supply for proper functioning. Any mechanism impairing blood supply will lead to impaired function of myocardium. Impaired myocardial function leads to heart failure which is most lethal complication of MI. Heart failure is quite common in STEMI patients. Heart failure in NSTEMI and unstable angina seems less frequent but usually quite high number is seen in clinical practice. Heart Failure in patients of STEMI is well studied but HF in NSTEMI is not well known along with its prognosis.[6] GRACE registry shows almost equal evidence of HF in STEMI (15.6%) and NSTEMI (14.7%) whereas UA has lesser mortality with HF. As the incidence of non-STEMI is increasing, the need of the time is to assess determinants and the impact of HF in NSTEMI.[7]

Left ventricular systolic dysfunction (LVSD) as a result of Myocardial infarction is quite frequent

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and is present in more than 50% cases. Out of these almost 25% develop Heart failure. With advancement in myocardial revascularization techniques and evidence based practice, the rate of HF has reduced to 50%. But still this complication is challenging for clinicians, as 80% of morbidity and mortality in myocardial infarction occur with heart failure.[8]

Burden of HF along with its management strategy is of prime importance in cardiology as it shares high impact on outcome of MI in terms of mortality. It was found in one study that Survival is higher in patients without congestive heart failure than with congestive heart failure patients.[9,10]

Ahit MC, et al. reported the 10.6% frequency of HF in NSTEMI patients with old age, female gender, very high heart rate, higher presenting heart rate, diabetes, hypertension and previous history of MI are significant risk factors noted.[11,12] Kaul P, et al reported 13.6% patient of HF in STEMI and 14.8% patients of HF with NSTEMI ($P < .01$).[13] Roubin SR, et al reported it to be 10.5% and it was associated with high mortality rate.[14,15] Franco E, et al reported that up to 15% of patients with NSTEMI present at admission with heart failure and its management guidelines are still limited and need further discussion.[16]

Limited data is available about the incidence of heart failure in patients of NSTEMI in Pakistan. As NSTEMI is a common presentation in cardiac emergencies and heart failure along with NSTEMI leads to significant morbidity and mortality, we have designed this study to determine the frequency of heart failure in NSTEMI patients. Early diagnosis and management of heart failure in NSTEMI patients can decrease the length of stay in hospital, time of recovery, decrease morbidity and decrease the treatment cost.

To determine the frequency of heart failure in non-ST elevation myocardial infraction (NSTEMI) patients

OPERATIONAL DEFINITIONS

Non-ST elevated myocardial infraction (NSTEMI)

Any patient presenting with chest pain along with changes in ECG including ST segment depression, T wave inversion, no progression to Q waves and raised cardiac biomarkers including Troponin I > 0.3 ng/ml, Troponin T > 100 ng/L), was labeled as having NSTEMI.

Heart Failure: 105

Any patient presenting with Killip classes II to IV was labeled as having heart failure:

- Class II: Patients with crepitations in the lungs, elevated jugular venous pressure (JVP) and 3rd heart sound.
- Class III: Patients with frank acute pulmonary edema.
- Class IV: Patients in cardiogenic shock (Systolic BP < 90 with inotropic support and < 80 without ionotropic support along with cold clammy extremities, pallor and confusion) and evidence of peripheral vasoconstriction (sweating, cyanosis, oliguria-measured as urine output less than 400ml per 24 hour in adults). It was defined as coronary catheterization (angiography/angioplasty) using trans-radial approach.

MATERIAL AND METHODS

The study was conducted at cardiac emergency, Faisalabad Institute of Cardiology, Faisalabad from 8th July 2019 to 7th January 2020. The study design was Descriptive, Cross sectional study Non-probability consecutive sampling technique was adopted. The Sample size of 150 by taking 5% level of significance, 5% margin of error and taking percentage of heart failure in NSTEMI as 10.6%.[9]

Inclusion Criteria

1. All patients between 18 to 75 years of either gender admitted with NSTEMI were included in the study.
2. Patients with or without past history of Ischemic heart disease.

Exclusion Criteria

1. Patients with active cancer or any malignant

tumor or autoimmune inflammatory disease
2. Patients with final diagnosis other than NSTEMI, such as STEMI, unstable angina, takotsubo cardiomyopathy and myocarditis.
3. Patients with liver, renal failure or with acute stroke.

After informed consent from the patients those fulfilling the operational definitions and the inclusion criteria were enrolled in the study. Each patient was assessed by history taking and clinical examination to ensure the diagnosis of heart failure. Smoking, hypertension, dyslipidemia, diabetic, previous history of MI, CABG and pPCI were noted. Relevant lab investigations and radiological investigations was sent to the relative departments. Age, weight, height, respiratory rate, blood pressure, gender, signs and symptoms of heart failure were noted. Patients who developed HF or pulmonary edema were also noted. Quantitative and qualitative variables were entered into the predesigned proforma.

Statistical Analysis

The data was analyzed using SPSS version 24.0. For qualitative variables Frequency and percentage were calculated. These include gender, smoking history, dyslipidemia, diabetes, previous history of MI, previous history of PCI, various signs and symptoms of heart failure, Killip class and heart failure at presentation. For the quantitative variables like weight, height, respiratory rate, BMI, blood pressure, troponin I, and LVEF, mean ±SD were calculated.

Effect modifiers like age, gender, smoking history, dyslipidemia, diabetic, previous history of MI, previous history of pPCI and BMI were stratified to know the effect of these on the outcome, through chi square ($p<0.05$ was considered significant).

RESULTS

Patients included in this study were 18 to 75 years with mean age of 44.28 ± 7.70 years. 88 (58.67%) were between 18 to 45 years of age. Out of the 150 patients, 116 (77.33%) were male and 34 (22.67%) were females (Figure-2). Distribution of patients with other confounding variables is shown in Table-I.

Frequency of heart failure in NSTEMI patients was found in 20 (13.33%) patients as shown in Figure-1.

When stratification was done for age groups with respect to heart failure, it was found that there was no significant difference of heart failure between different age groups as shown in Table-II while gender stratification did not showed statistically significant difference. Stratification of heart failure with respect to BMI showed no statistically significant difference. Table-III, IV and V show the stratification of heart failure with respect to diabetes mellitus, dyslipidemia and smoking respectively. Table-VI & VII have shown the stratification of heart failure with respect to previous history of MI and previous history of pPCI respectively.

Confounding Variables		Frequency	%age
BMI (kg/m2)	≤30	92	61.33
	>30	58	38.67
Diabetes mellitus	Yes	73	48.67
	No	77	51.33
Dyslipidemia	Yes	86	57.33
	No	64	42.67
Smoking	Yes	93	62.0
	No	57	58.0
Previous history of MI	Yes	61	40.67
	No	89	59.33
Previous history of pPCI	Yes	30	20.0
	No	120	80.0

Table-I. Distribution of patients with other confounding variables. (n=150)

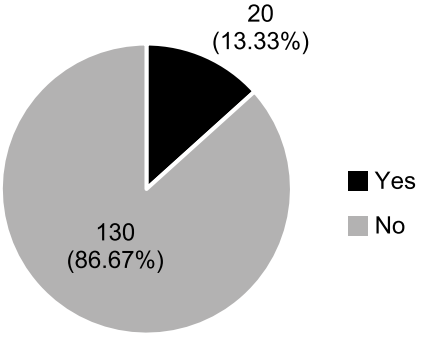

Figure-1. Frequency of heart failure in non-ST elevation myocardial infraction (NSTEMI).

Age (years)	Heart Failure		P-Value
	Yes	No	
18-45	11	77	0.721
46-75	09	53	

Table-II. Stratification heart failure with respect to age groups.

Diabetes Mellitus	Heart Failure		P-Value
	Yes	No	
Yes	11	62	0.543
No	09	68	

Table-III. Stratification of heart failure with respect to DM.

Dyslipidemia	Heart Failure		P-Value
	Yes	No	
Yes	10	76	0.476
No	10	54	

Table-IV. Stratification of heart failure with respect to dyslipidemia.

Smoking	Heart Failure		P-Value
	Yes	No	
Yes	10	83	0.235
No	10	47	

Table-V. Stratification of heart failure with respect to smoking.

Previous History of MI	Heart Failure		P-Value
	Yes	No	
Yes	12	49	0.059
No	08	81	

Table-VI. Stratification of heart failure with respect to previous history of MI.

Previous History of pPCI	Heart Failure		P-Value
	Yes	No	
Yes	04	26	1.000
No	16	104	

Table-VII. Stratification of heart failure with respect to previous history of pPCI.

DISCUSSION

Heart failure (HF) is a common cardiovascular presentation and leads to significant contribution in national healthcare costs in the western world.[17,18] Heart failure can be a result of multiple etiologies with ischemic heart disease being the most common along with myocardial diseases and valvular lesions. With developments in the field of cardiology and use of PCI as revascularization strategy, the incidence and outcome of heart failure has also been changed. Between 1996 and 2008 a Swedish registry (SWEDEHEART) showed a reduction in the incidence of HF from 50% to 28%.[19] In a Canadian study, STEMI patients who develop HF had associated 1-year mortality of 9.9%.[20]

In our study, frequency of heart failure in NSTEMI patients was found in 20 (13.33%) patients. Ahit MC, et al. reported the 10.6% frequency of HF in NSTEMI patients with old age, female gender, very high heart rate, higher presenting heart rate, diabetes, hypertension and previous history of MI are significant risk factors noted.[11,12] Kaul P, et al reported 13.6% patient of HF in STEMI and 14.8% patients of HF with NSTEMI ($P < .01$).[13] Roubin SR, et al reported it to be 10.5% and it was associated with high mortality rate.[14,15] Franco E, et al reported that up to 15% of patients with NSTEMI present at admission with heart failure and its management guidelines are still limited and need further discussion.[16]

In Japan 5429 STEMI patients showed HF hospitalization pf 4.4% per year in 1st year followed by 1% per year.[21] From 1990 to 1999 Velagaleti et al. did 5 years follow-up of MI patients and found that 14.8% of patients developed congestive HF.[22] In a Canadian study conducted between 1994 and 2000, patients with MI and who were 65 years or older without HF during their admission, 71% (3040/4291) developed HF by 5 years.[23]

A study showed incidence of heart failure after discharge to be 33%.[24] In another study, 10 years follow-up was done for patients of MI. It showed 22.4% incidence of heart failure within 1 month of admission and 12.4% had one admission for 10 years followup. [25] Olmsted County (Minnesota, USA) study observed 41% incidence of HF in MI patients followed for 6.6 years.[26] A Norwegian study showed, 17.1% developed in-hospital HF among 69,372 patients admitted with MI and 1 year follow up showed 5.4% HF.[27]

Coronary artery involvement in NSTEMI also have correlation with development of Heart failure. Patients with Single vessel disease are less prone to have HF then those with two vessel and three vessel cor. Artery disease. One study showed

similar results of HF in ACS patients with or without obstructive CAD[28] but that study included patient's ≥75 years only. Myocardial injury in patients of heart failure there is rise in cardiac troponins which resemble MI.[29]

The study of Mehta et al[30], showed the incidence rates of HF at 24 h to be 2.7%, at 7 days it was 4.9%, and 6.3% at 6 months in OASIS-2 trial. These were significantly lower than those mentioned in the GRACE registry.[31] Patients in the OASIS-2 trial were at high risk of death or MI who developed HF than those without HF. HF patients were older, preferably female, and mostly diabetic, hypertensive, and with h/o prior MI. These patients had similar high-risk characteristics as patients with HF in our study.

Out of GRACE registry[32] the factors leading to increased incidence of HF in NSTE-ACS were evaluated. It was concluded that the incidence of HF was 13% and it was similar in patients with (14.7%) and without (15.6%) ST elevation MI. It was less in patients with UA (8.2%). In SAVE study[33], majority of patients with LV systolic dysfunction showed no HF (60%), in the VALIANT study[34], 42% of patients with HF did not have LV systolic dysfunction (LVSD). In our study, we targeted the highest risk patients including post-AMI patients having both clinical signs of HF and LVSD.

CONCLUSION

Our study concluded that there is high incidence of heart failure in patients of non-ST elevation myocardial infraction (NSTEMI). So, we recommend that these particular patients should be evaluated properly for heart failure and timely management is required in order to reduce the morbidity and mortality of these particular patients.

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3	Rehan Riaz	Data collection / Manuscript writing.	
4	Naeem Hameed	Proof Reading.	