



MYOCARDIAL INFARCTION; NEW ONSET HEART FAILURE AFTER MI. ITS FREQUENCY AND FACTORS CONTRIBUTING IT

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Article received on:

01/02/2017

Accepted for publication:

15/06/2017

Received after proof reading:

08/09/2017

ABSTRACT... Objectives: To determine the frequency of new onset heart failure after acute myocardial infarction and factors contributing it. **Methods:** A total of 228 patients were studied for occurrence of new onset clinical heart failure within 24 hours after admission with an acute Myocardial Infarction. Clinical parameters were used to diagnose heart failure. Various risk factors were analyzed which contributed to occurrence of heart failure after MI. Patients undergoing primary angioplasty were not included into this study as medical thrombolysis was the most common mode of therapy (in >90% of patients). **Results:** Among the 228 patients studied 77.2 % (176) were males and 22.8 % (52) were females. Mean age of the population was 56.3(±12.1) years. Women were relatively older on presentation as compared to men (mean age 58.9±10.9yr vs 55.5±12.3yr). Similarly mean age for NSTEMI was higher as compared to STEMI (58.59±11.1 vs 54.2±12.6yr.). A total of 36.8 % (84) patients exhibited clinical signs of heart failure within 24 hours of their admission. These patients tend to be older than patients without HF (mean age 60±11years vs 54±12 years). Females after MI showed a greater frequency for going into HF as compared to males (42.3% vs 35.2% respectively). Now regarding the association of HF with various factors it was seen that, having a previous history of MI was found to be the strongest factor associated with occurrence of HF, with HF being nearly three times more common in these patients (i.e. 73% vs 26.1%, p value < 0.05). The current type of MI on presentation also showed a direct relationship with HF, being highest in patients with NSTEMI (i.e. up to 50 %) followed by AAMI (35.5%) and lowest in inferior wall MI (p value < 0.05). Diabetes, hypertension and smoking also showed a higher but statistically non-significant relationship with HF development (41.2% vs 34.3%, 41% vs 32.2% and 44% vs 32% respectively p value > 0.05). The blood pressure on presentation however was significantly associated with HF in these patients. Patients having high BP (> 140/80) on presentation depicted an overall higher incidence of HF as compared to patients having BP equal to or less than 140/80 (45.2% vs 31.3% p value < 0.05). **Conclusion:** Heart failure is a fairly common entity after acute MI, being the commonest in patients suffering an NSTEMI. Previous history of an MI showed to be the strongest coexisting factor associated with HF.

Key words: Heart failure. Myocardial infarction.

Article Citation: Anjum M, Rashid MA, Hussain A, Imam S. Myocardial infarction; new onset heart failure after MI. Its frequency and factors contributing it. Professional Med J 2017;24(9):1280-1285. DOI: 10.17957/TPMJ/17.3860

INTRODUCTION

The prevalence of heart failure (HF) has increased owing to the aging of general population. Moreover the prolongation of survival rates of ischemic heart disease (IHD) patients due to advancements in management strategies has also added to the pool of HF. The burden of problem is shown by the high numbers, with current worldwide HF population reaching upto 23 million¹ and annual hospitalizations with HF exceeding one million² just in the US. Despite the advancements in available therapies for HF the

mortality rate remains high exceeding most of the malignancies.³ This makes its early detection and prevention so imperative.

IHD is established as the leading cause of HF in the developed nations. The Framingham Heart Study (FHS) showed that at age 40, the overall lifetime risk of developing HF in men with IHD was one in five, while without an antecedent MI it was one in nine.⁴ The US National Health and Nutrition Examination Survey (NHANES I) on 13,643 individuals showed that over a period of

twenty years the relative risk (RR) attributable by IHD for HF⁵ was 8.1, the highest than RR attributed by DM, HTN, Smoking, obesity and valvular diseases combined.⁶

HF after MI is an important prognostic factor, with such patients showing prolonged hospital stays and higher in hospital mortality.^{7,8} It also aids us deciding the mode of therapy, by choosing early invasive strategy for these patients.⁹⁻¹² In the developing nations where valvular heart disease was once the commonest cause for heart failure, a rapid surge in IHD incidence is expected to change the epidemiology of HF as well.¹³

Although HF is common in patients suffering from various ischemic syndrome, its occurrence acutely after an episode of MI has not been extensively studied even in the west, especially in terms of the factors contributing it after such an event. However there is recent enthusiasm to study the trends in this subject worldwide^{14,15}, owing to the advancements in IHD and HF therapies. But in the developing nations like Asia this has largely been a un-attended¹² subject. Not only genetic and racial factors¹⁶, variation in lifestyle and local management practices also determine the risk for developing HF. Our study is one of the earliest studies in the region addressing the magnitude of HF in an acute MI population, and describing its association with common factors. The study will address association of factors like DM, HTN, smoking, previous history of MI to development of HF. In VALIANT trial heart failure after acute MI was found to be present in 23.1% of patients.^{17,18} after MI, this more strongly necessitates local studies in our population .

METHODS AND DATA COLLECTION

A total of 228 consecutive patients presenting to the Emergency department at Punjab institute of cardiology who met the inclusion and exclusion criteria were enrolled into the study after obtaining an informed consent by each.

Inclusion Criteria

All patients presenting to the emergency department with acute MI (STEMI as well as NSTEMI) having age 30 years to 90 years, who

consent for the study.

Exclusion Criteria

Patients with previous history of acute or chronic HF, as available from previous medical records, patients with connective tissue disease or interstitial lung disease as in previous record or presence of physical signs of such an illness. Patients with known chronic kidney disease or a creatinine value more than 1.5 mg/dl on presentation. Patients with mechanical complication of MI i.e. ventricular septal rupture, myocardial free wall rupture or ischemic severe mitral regurgitation were also excluded from the study.

Patients were diagnosed to have acute STEMI if presenting with ischemic chest pain and ST-segment elevation of more than 1mm in two adjacent ECG leads. NSTEMI was diagnosed in patients with ischemic chest pain, ST-segment depression or T-wave inversion on ECG and raised troponin-T.

Basic demographics were noted, like age gender address, medical record number and contact number. Detailed history and physical examination was carried out as well as previous medical records and medications were reviewed. Above information was used to establish the presence of risk factors viz DM, HTN, previously known IHD, Family history of IHD, dyslipidemia and smoking and previous HF. The Blood pressure was measured from both arms with patient in lying to 45 degree reclining position. An average of three readings taken (at least five minutes apart each) were taken. Each patient was followed for occurrence of clinical heart failure during the first twenty four hours. Patients' chest was auscultated from back and front in sitting position. The precordium was auscultated in sitting and 45 degree reclining position. Patients were diagnosed to have clinical HF if bilateral fine crepitation were present in chest with no non-cardiac cause present for that (as mentioned in exclusion criteria). Presence of a third heart sound was an additional clue but was not necessary for diagnosis of HF (this criteria is equal to KILLIP class II). Bedside echocardiography was done in

patients suspected to have cardiac mechanical complications on physical examination. Moreover admission samples for RBS, lipid profile and creatinine level and next morning fasting sample for blood glucose was obtained. All samples were analyzed from hospital's central laboratory. Patients were diagnosed to have new DM if FBS > 110mg/dl or RBS > 180mg/dl. Patients were not labelled as smokers if they had quit smoking at least for three years.

Statistical Analysis

All the data was analyzed using SPSS version 16. Continuous variables like age were presented as mean and standard deviation. Overall frequency of HF as well as its frequency across both genders and in various types of MI was calculated. Pearson Chi square test was used to assess the association of DM, HTN, Smoking, positive family history for IHD, previous history of MI, presenting blood pressure, type of current MI and administration of streptokinase with the occurrence of HF. A p-value of < 0.05 was considered statistically significance.

RESULTS

Among the 228 patients studied 77.2 % (176) were males and 22.8 % (52) were females. The baseline characteristics of patients are shown in table. Mean age of the population was 56.3(\pm 12.1) years. Women were relatively older on presentation as compared to men (mean age 58.9 \pm 10.9yr vs 55.5 \pm 12.3yr). Similarly mean age for NSTEMI was higher as compared to STEMI (58.59 \pm 11.1 vs 54.2 \pm 12.6 yr).

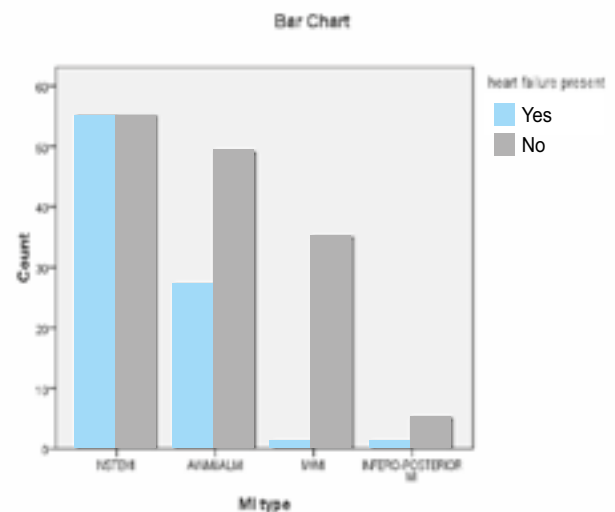
Write frequency of various types of mi. about 22.8% of patients were suffering a recurrent MI, i.e they had previous history of MI. A total of 36.8% (84) patients suffered clinical heart failure during the first 24 hours of their admission after an MI. these patients tend to be older than patients without HF (mean age 60 \pm 11years vs 54 \pm 12 years). Women were affected more as compared to men (42.3% vs 35.2% respectively). The frequency of HF after various sub types of MI are shown in table. The type of MI was significantly associated with the occurrence of HF (p value < 0.05). It was seen

highest in patients presenting with a NSTEMI (i.e. 50 %) followed by AWMI (35.5%) and was lowest in patients with an inferior wall MI.

The presence of previous history of MI was strongly associated with occurrence of HF (i.e. 73% vs 26.1%) with a (p value < 0.05). it is overall the most important factor responsible for HF after an MI. it must be due to a significant underlying damaged myocardium so the reserve of rest of the myocardium in quite at stake and goes into hf after a new MI.

Heart failure was more common among patients who were diabetics, hypertensive or smokers (41.2% vs 34.3%, 41% vs 32.2% and 44% vs 32% respectively), although these differences were not statistically significant (p value > 0.05)

The BP on presentation however significantly affected the occurrence of HF in these patients. Patients having high BP (> 140/80) on presentation depicted a higher incidence of HF as compared to patients having BP equal to or less than 140/80 (45.2% vs 31.3% p value < 0.05) a total of 7.5% of the patients experienced various form of arrhythmias, VT(41.2%) being the commonest among these. But there was no significant relation between and of these arrhythmias and occurrence of HF.



	Patients with heart failure	Without heart failure	total
Age	60±11years	54±12 years	
Male	35.2% (62)	(114)	77.2%(176)
Female	42.3% (22)	(30)	22.8% (52)
NSTEMI	50% (55)	(55)	48.2% (110)
Anterior/Anterolateral MI	35.5% (27)	(49)	33.3% (76)
Inferior MI	(1)	(35)	15.8% (36)
Infero-posterior MI	(1)	(5)	2.6% (6)
DM	(35)	(50)	37.3% (85)
HTN	(50)	(72)	53.5% (122)
DYSLIPIDEMIA	(14)	(37)	22.4% (51)
SMOKING	(37)	(47)	36.8% (84)
Family history of IHD	(13)	(16)	12.7% (29)
Previous History of MI	(34)	(14)	22.8% (52)
Presenting BP <140/80	(51)	(105)	68.4% (156)
Presenting BP > 140/80	(33)	(390)	31.6% (72)
Arrhythmia present	(5)	(12)	7.5% (17)
Total patients	36.8% (84)	63.2% (144)	228

Table-I. Characteristic of patients presenting with heart failure

DISCUSSION

Global awareness about the risk factors for development of HF as well as aggressive management of this entity start from its outset tend to decrease the global burden of HF but enhanced survival for IHD has somewhat balanced or even increased its burden worldwide.¹⁹ Rapidly changing lifestyles in the developing nations has been increasing the incidence of IHD at a tremendous rate. So the rate of new onset HF and its epidemiology¹³ is expected to rise in parallel over here. Moreover there can still be a significant difference in clinical practices and facilities available for management of post MI patients, like use of SK instead of tPA, very less number of primary PCIs, prolonged times from onset of MI and presentation to hospital. So this study can give us a glimpse into the insight of this problem in this region.

While looking at the studies in the west we find high incidence of HF after an episode of mi. The Valsartan in Acute Myocardial Infarction trial (VALIANT) showed that HF after MI occurred in 23.1% of patients during admission, and 24.5% were prescribed a diuretic on discharge.²⁰ Similar incidence (23%) was seen in the 'Intravenous nPA for the Treatment of Infarcting Myocardium Early II study (In TIME II)'.²¹ The incidence of HF after MI was even more in our study (36.8%), but it can be explainable by the standard use

of tPA or equivalents instead of SK which was solely used in our part of the world, in addition to other differences in clinical practices. Only the Worcester Heart Attack Study (WHAS) seems to differ, reporting a much higher (40%) rate of heart failure reported after AMI.²² However in this study 36% of the MI in this study were recurrent which is associated with a higher incidence of HF and that can be another explanation for higher incidence of post MI heart failure in our study as well, which was having 22.8% patients with a previous history of MI.¹⁴ The Global Registry of Acute Coronary Events (GRACE) showed that the incidence of HF after MI was higher as compared to unstable angina(UA).²³ While searching for the literature on heart failure after an MI in developing nations like south east Asian countries, we do not find significant data on the subject.

Now regarding associating of various factors with HF occurrence, it is observed that presence of a past MI was strongly associated with occurrence of HF after an acute MI. it must be due to a significant underlying damaged myocardium so the reserve of rest of the myocardium in quite at stake and goes into HF after a new MI. other studies have shown a similar correlation between recurrent MI and increased incidence of post MI heart failure.¹⁴ the type of MI had significant relationship with incidence of acute HF, being commonest among NSTEMI followed by anterior MI. this can

be explainable by multivessel nature of disease, advanced age and presence of multiple risk factors in NSTEMI patients. Also these patients tend to have late presentations and less options are available to salvage the myocardium, e.g. among anti-thrombotics these patients routinely get only conventional heparin, no anti Xa or GP IIb Inhibitors, nor they routinely get a chance for urgent angiography and revascularization. While STEMI patients can at least get an SK therapy. Hence more non salvaged myocardium means more HF.

It was seen that presence of HTN was associated with post MI heart failure. Moreover it was elaborated that high BP on presentation was highly associated with HF. These results correspond with another study by Richards AM and colleagues showing that hypertensive patients show greater incidence (33 versus 24 percent for normotensives) of HF after MI during hospital admission.²⁴

DM increases the risk for occurrence of HF generally during the life time of an individual²⁵, we have seen in our study that there is higher incidence of HF in patients with DM, although this difference did not reach statistical significance for after an episode of MI.

LIMITATIONS

Although most of the complications after an acute MI are concentrated towards the earlier period after admission, and so was the time frame targeted in our study. But patients may and do develop HF later on during the hospital stay or in the earlier period after discharge, so more studies focusing over an extended period of time are needed to elaborate the temporal occurrence of HF.

There was an “overrepresentation” of academic institutions in the selection of the centers. However, 60% of community hospitals and nearly 50% of private clinics participated. Because there was a much larger number of community hospitals, a majority of the included patients came from these hospitals,

CONCLUSION

There is a significantly high proportion of patients going into heart failure after an acute MI. our study provides a detailed insight into the association of various factors with occurrence of heart failure in a south East Asian population post MI.

Future Perspectives

After knowing the frequency of HF after mi and factors contributing to it in our set-up, newer studies should aim at defining the optimal therapeutic and interventional strategies to minimize this dreadful complication.




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