



ORIGINAL ARTICLE

Frequency of cardiogenic shock in acute inferior wall myocardial infraction.

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ABSTRACT... Objective: To determine the frequency of cardiogenic shock and its associated factors in patients with inferior wall myocardial infarction in tertiary care hospital. **Study Design:** Observational Descriptive study. **Setting:** Department of Cardiology, National Institute of Cardiovascular Disease (NICVD), Karachi. **Period:** January to July 2017. **Material & Methods:** A total of 241 patients with acute inferior wall MI presented with the complain of chest pain for more than 30 minutes and less than 24 hours were recruited in this study. A detailed history including age, sex, family history and co-morbidities status was taken. Patients undergone right sided ECG. Cardiac shock was assessed and recorded prospectively. **Results:** There were 144 male and 97 female patients. Mean age was 52.58 ± 10.13 years. 44.8% were hypertensive, 14.5% were diabetic, 19.1% had family history of CAD, and 14.9% were smokers. In our study, 7.9% cases were found with cardiogenic shock. The association of cardiogenic shock was found significant with age, female gender, co-morbidities (P-values < 0.05). **Conclusion:** Cardiogenic shock (CS) remain the leading cause of death in hospitalized patients with myocardial infarction. The present study concluded that there is increased risk of cardiogenic shock in patients having inferior myocardial infarction along with right ventricular infarction. The study shows prevalence of cardiogenic shock and factors that increases the risk. The factors such as age, female gender, patients with medical conditions such diabetes and hypertension, smoking status are risk factors of cardiogenic shock in patients with coronary heart disease.

Key words: Cardiogenic Shock, Inferior Wall, Myocardial Infraction.

INTRODUCTION

Coronary heart disease incident has been increased significantly in the Asian continent over the periods. The leading cause of mortality and disability in the western continent was used to be coronary heart disease. However, the fatality rate has been decreased over the decades. Whereas the population over the age of 35 years is still at high risk for chronic heart disease mortality and is the prevalence of coronary heart is estimated to increase worldwide.^{1,2} Economical deterioration is one of the overlooked grounds for increase prevalence of chronic heart disease mainly in South Asian region as compare to western population.³

Among coronary heart disease, myocardial infarctions in inferior wall have been reported in more than 70% cases which is mainly the

occlusion of dominant artery. The dominant artery gives rise to AV nodal artery. Originally, it was believed that necrosis of AV node leads to complete heart block. However, with the advances in field of cardiology, it has been reported that necrosis of AV node rarely occurs even if entire AV nodal artery has been occluded.⁴ Almost half of the myocardial infarctions are reported as inferior wall myocardial infarction. The prognosis of inferior wall myocardial infarction without any other involvement is favorable having 2-9% mortality rate. The involvement of right ventricle during inferior wall myocardial infarctions makes worst clinical outcomes and has been reported about 40% among all cases. Almost half of the patients diagnosed with inferior wall myocardial infarction has complications that subsides later to give a favorable prognostic outcome.^{5,6} Acute inferior wall myocardial infarction has also has

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favorable short term and long term prognosis having 8% mortality rate. The mortality rate is increased to 28% when right ventricle myocardial infarction occurs.⁷

Cardiogenic shock defined as ultimate pumping disability of heart causing clinical hypo perfusion in the body. It is also recognized when intravenous inotropes or intra-aortic balloon pump are required to maintain >90 mmHg of systolic blood pressure and >1.8 l.min⁻¹.m⁻² of cardiac index. The dissolution of blood clots also known as thrombolytic therapy at early stages reduces the risk of cardiogenic shock. The cardiogenic shock should be diagnosed after excluding all the causes of hypotension such as arrhythmias, pharmacological side effects, hypovolemia, electrolyte imbalance and vasovagal reactions. These are usually coupled with extensive damage of left ventricle. However, it might also occur in infarction of right ventricle.⁸

The sign and symptoms of cardiogenic shock includes increased heartbeat, low blood pressure, cool extremities, lesser urine output and altered mental status. The hemodynamic evaluation reveals prolonged hypotension with systolic blood pressure equal to <90 mm Hg for minimum of 30 minutes, low cardiac index of <2.2 L/min/m², and complete occlusion of pulmonary artery pressure of ≥ 15 mm Hg.⁹ The extensive destruction of left ventricular muscles, rupture of papillary muscles, rupture of ventricular septum, right ventricular infarction or free-wall rupture are the mechanical complications leading to cardiogenic shock. The major debilitating phenomenon of cardiogenic shock is complicating almost 10% cases of acute myocardial infarction leading to increase in overall mortality rates complicates. Despite of the advantages of early percutaneous vasovagals intervention or CABG, the diagnosis of cardiogenic shock foreshadows a rising fatality rate of 50%. The deaths occur within two days of cardiac shock.¹⁰

In addition, there is two-fold increased risk of developing cardiogenic shock in patients having ST segment elevated myocardial infarction as compare to the patients having

non-ST segment elevated myocardial infarction. Similarly, the patients having non-ST segment elevated myocardial infarction are at low risk of undergoing early cardiac catheterization, delayed percutaneous intervention, and coronary artery bypass graft. Thereby, increasing mortality rate.¹¹ The incidence of cardiogenic shock is found higher among women and patients aged >75 years. The population living in Asia and Pacific Island is also at high risk of developing cardiogenic shock. Literature have revealed that there is increase in incidence of cardiogenic shock over the years for which the reason is yet to be researched whereas with better diagnosis and improved access to care it can be reduced.¹²

Inferior wall infarctions that are complicated by heart block and associated with pre-cordial ST-segment depression and right ventricle involvement have worst prognosis as compare to patients without these characteristics. The effect of thrombolytic therapy for high risk patients is still debatable. Currently, there is conflicting evidence regarding the viability of thrombolysis in patients with inferior wall infarction. In the light of increasing evidence, the patients with the largest infarctions are benefited the most from acute reperfusion. The patients in these subgroups could be able to get advantage from thrombolytic therapy. The purpose of this study is to find out the frequency of cardiogenic shock in patients presenting with acute inferior wall myocardial infarction to reinforce the practice of undertaking a right sided electrocardiogram in every single patient presenting with acute inferior wall myocardial infarction which might enhance the clinical outcome for the patient. Moreover identify the associated risk factors of cardiogenic shock.

MATERIAL & METHODS

The observational descriptive study has been conducted between January to July 2017 at Department of Cardiology, National Institute of Cardiovascular Disease (NICVD), Karachi. The study was initiated after taking ethical approval from the institutional ethical committee. The sample size was estimated by using WHO calculator Sample Size was estimated by taking

the prevalence of cardiac shock in myocardial infarction as 8.5%¹³ keeping margin of error (d) as 4%, and taking confidence level as 95%; the estimated sample size came out as 187 patients. The study recruited 241 patients via consecutive sampling technique.

The patients between age 20 to 65 years old of either gender experiencing chest pain for more than 30 minutes during last twenty-four hours and diagnosed with acute inferior wall myocardial infarction were included in the study. Myocardial infarction is defined as the involvement of inferior wall indicated via electrocardiographic finding of ST segment elevation of ≥ 1 mm in two or more of leads II, III and AVF. The patients who were diagnosed with Inferior wall myocardial infarction based on clinical history without ECG at initial stages were excluded from the study.

The consents were taken from the patient's attendants. The demographics of the patients were collected by principal investigator of the study. Patients underwent ECG under the supervision of resident. Cardiogenic shock was observed defined as systolic blood pressure < 90 mmHg for minimum of 30 minutes. The details of patient's co-morbidities such as diabetes mellitus, hypertension, social history like smoking and Family history of heart related disease was recorded. Strict inclusion and exclusion criteria were followed in order to control the effect modifiers and biasness in the study. Data was recorded in predesigned proforma.

Data was entered and analyzed by statistical package for Social Sciences (SPSS) Version 22. Frequency and percentages were calculated for qualitative variables such as gender, diabetes, hypertension, family history of coronary artery disease, smoking, and cardiogenic shock. Mean and standard deviations were calculated for quantitative variable such as age, BMI, and cholesterol level. The association of cardiogenic shock with gender, age, BMI, cholesterol level, co-morbidities such as diabetes and hypertension and family history was assessed using Chi-square test. The p-value ≤ 0.05 was considered as significant.

RESULTS

A total of 241 patients of either gender with age 20 to 65 years meeting inclusion criteria of study were evaluated to determine the frequency of cardiogenic shock in inferior wall myocardial infarction.

Detailed demographics and medical condition shown in Table-I where Out of 241 study subjects, 144(59.8%) were male and 97 (40.2%) were female. Male ratio is higher as compared to female. The overall mean age of study subjects was 52.58 ± 10.13 years. Majority of patients (59.8%) have age 55 or less. Mean BMI was 26.67 ± 4.17 kg/m² while 22% patients were obese and high cholesterol level was found in only 9% of the patients. Co morbidities like hypertension and diabetes were shown as 44.8% and 14.5% respectively. Smoking status was also observed and found that 14.9% patients were smoker in this study while 19.1% patients have family history of CAD. In our study, 7.9% cases were found with cardiogenic shock. The frequency distribution of cardiogenic shock is presented in Figure-1.

Association of cardiogenic shock with regards to gender, age, BMI, Cholesterol, hypertension, diabetes mellitus and family history of CAD was done to observe effect of these confounders on cardiogenic shock. P-value kept ≤ 0.05 as significant. The results showed that there was significant association of cardiogenic shock with gender, hypertension, age, obesity, diabetes mellitus and family history with P-value < 0.05 . The detailed results of associations are presented in Table-II.

DISCUSSION

The present study findings showed that 7.9% patients with inferior wall myocardial infarction had developed cardiogenic shock. The other study showed 6% prevalence of cardiogenic shock. Various studies have shown that cardiogenic shock has increased the mortality rates in the MI patients. However, patients who have not developed cardiogenic shock had shown improved survival rates.^{12,14-16}

Demographic Characteristics	Statistics
	Mean (SD) & N (%)
Age groups(in years)	
	52.58(10.13) yrs.
55 or less years	140(58%)
More than 55 years	101(42%)
Gender	
Male	144(59.8%)
Female	97(40.2%)
Body Mass Index	
	26.67(4.17)kg/m ²
Obese	52(22%)
Non-Obese	189(78%)
Cholesterol level	
	211.19(20.23)mg/dl
≥ 240mg/dl	22(9%)
> 240mg/dl	219(91%)
Hypertension	108(44.8%)
Diabetes Mellitus	35(14.5%)
Family history of CAD	46(19.1%)
Smoking	36(14.9%)

Table-I. Demographic characteristic of inferior wall myocardial infarction patients.

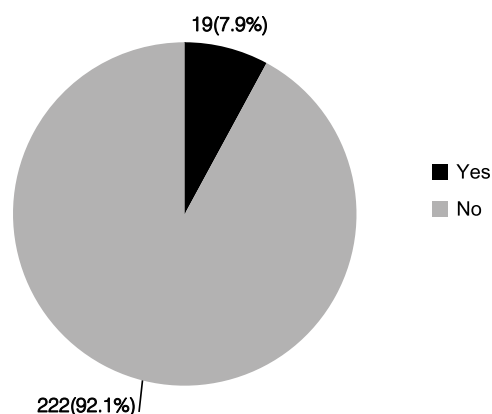


Figure-1. Frequency distribution of cardiogenic shock. (n=241)

It has been reported that Pakistan has highest incidence of coronary artery disease. Another study also showed that the complications arise during myocardial infarction are accountable for the high mortality rate. In addition, increased in-hospital morbidity and mortality has also been reported.¹⁴ In the present study, 59.8% were male and 40.2% were female. Male ratio is higher as compared to female. The overall mean age of study subjects was 52.6 ± 10.1 years.

Associated Factors		Cardiogenic Shock		P-Value
		Yes	No	
Gender	Male	7(4.9%)	137(95.1%)	0.034*
	Female	12(12.4%)	85(87.6%)	
Age groups	≤55 years	6(43%)	134(95.7%)	0.015*
	>55 years	13(12.9%)	88(87.1%)	
Obesity	Non Obese	9(5%)	170(95%)	0.001*
	Obese	10(19.2%)	42(80.8%)	
Cholesterol level	<240 mg/dl	8(3.7%)	211(96.3%)	0.0001*
	≥240 mg/dl	11(50%)	11(50%)	
Hypertension	Yes	14(13%)	94(87%)	0.008*
	No	5(3.8%)	128(96.2%)	
Diabetes Mellitus	Yes	7(20%)	28(80%)	0.004*
	No	12(5.8%)	194(94.2%)	
Family history of CAD	Yes	12(26.1%)	34(73.9%)	0.0001*
	No	7(3.6%)	188(96.4%)	
Total		19	222	

Table-II. Association of cardiogenic shock according associated factors.
Chi Square Test was applied. P-value ≤ 0.05 considered as significant.

Similarly, in the study conducted by Ali L et al. males (72.62%) were higher than females (25.6%). The mean age 58.7+12.3 was slightly higher as compare to present study years. Majority of the patients were in the age group 42-65 years. Diabetes, hypertension, and smoking were factors leading to myocardial infarction. Moreover, other factors like dyslipidemia, family history, and obesity were also present.¹⁷ Berger PB et al. found out that cardiogenic shock was the main contributing factor causing poor outcomes.¹⁸ Oswald G. assessed the frequency of undiagnosed diabetes in patients presented with acute myocardial infarction and the effect of diabetes in similar population. He found out that patients were more likely to die from cardiogenic shock those have higher plasma glucose levels. However, infarction size was associated with cardiogenic shock. The other finding of the same study showed that higher Hba1c levels were strongly associated with cardiogenic shock.¹⁹ The present study showed statistical significance between cardiogenic shock and diabetes.

Khalil L et al. also discovered hypertension, diabetes, tachycardia and infarction was leading factor for cardiogenic shock.²⁰ Similarly, hypertension and diabetes were found statistically significant in the present study. The combination of these factors poses great risk of coronary artery. Majority of the studies have investigated cardiogenic shock as a part of in-hospital mortality and hospital readmission. Mahmoud AN et al. assessed the causes of readmission and find out cardiogenic shock was major cause complicating acute myocardial infarction.²¹ In another study from France, it was found that patients who experienced cardiogenic shock were more likely to admit in intensive care unit and presented as critically ill patients.²² Another study found out that majority of the patients admitted in hospital had ST elevation myocardial infarction and they were already diagnosed with acute myocardial infarction with cardiogenic shock. The study provided basic risk factors of myocardial infarction with cardiogenic shock. There was greater number of cardiovascular morbidity and higher number of patients suffered from chronic total occlusion.²³ Owing to the previous literature,

the present study would be among pioneers to report the incidence of cardiogenic shock in Pakistani population. Literature have focused on the outcomes of myocardial infarction²⁴ and myocardial infarction associated with cardiogenic shock.^{25,26} Though cardiogenic shock is itself a major debilitating condition and should be reported as a separate entity.

In the present study, outcomes were not assessed. However, we aim to highlight the incidence of cardiogenic shock and we recommend conducting more studies to explore more in depth related to cardiogenic shock. The reported results of cardiogenic shock and factors associated will help clinicians combat it as early sign leading to increase in patient survival.

CONCLUSION

The present study results showed that there is increased risk of cardiogenic shock in patients having inferior myocardial infarction along with right ventricular infarction. The study shows prevalence of cardiogenic shock and factors that increases the risk. The factors such as female gender, patients with medical conditions such diabetes and blood pressure, smokers are risk factors of cardiogenic shock in patients with coronary heart disease. The other factors had low risk of developing cardiogenic shock.

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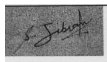
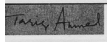
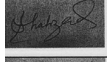
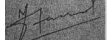
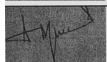
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AUTHORSHIP AND CONTRIBUTION DECLARATION

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2	Tarique Ahmed	Literature search, write-up, methodology.	
3	Shahzad	Literature search, write-up.	
4	Muhammad Faisal	Literature search, write-up, review.	
5	Abdul Mueed	Literature search, write-up, review.	
6	Maryam Younus	Data management, results and bibliography.	