FREQUENCY OF MITRAL REGURGITATION IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION AND ITS IN-HOSPITAL MORTALITY

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Author's Contribution

SA:Conducted the study and wrote the article. FI:Helped in review the article. SS:Re-arranged data and corrected article. IA:Tables and figures. MF and MZK made corrections and did the proof reading.

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ABSTRACT

BACKGROUND: Mechanical complications like mitral regurgitation (MR) and ventricular septal rupture can occur after acute myocardial infarction (MI). Out of which mitral regurgitation is relatively common. It can present with symptoms or without clinically evident symptoms. It may be associated with hemodynamic consequences. MR is usually detected on colour doppler echocardiography. The aim of this study was to see the frequency of mitral regurgitation in patients with acute myocardial infarction and to compare the mortality during hospital stay among sampled patients with and without mitral regurgitation.

MATERIAL AND METHODS: This was a descriptive case series carried out in the Cardiology department of Punjab Institute of Cardiology, Lahore during a period of six months after the approval from ethical board. A 165 patients who presented in emergency department with acute MI were enrolled. Demographics characteristics were recoreded. Echo was conducted during first 24 hours and presence or absence of mitral regurgitation was labeled as per operational definition. Patients were followed during hospital stay i.e. 7 days. Mortality during hospital stay was noted among patients with and without mitral regurgitation. Variables like age, presence of shock at presentation, uncontrolled diabetes, and left ventricular ejection fraction were the confounding variables and addressed by stratification of the groups.

RESULTS: Out of 165 cases of myocardial infarction, 45.45%(n=75) were having age of 20-50 years and 54.55%(n=90) were having age of 51-75 years. The mean age was 53.93 ± 10.29 years. Males were 52.73%(n=87) while females were 47.27%(n=78). Uncontrolled diabetes mellitus was present in 58.18%(n=96) while mitral regurgitation was recorded in 32.12%(n=53). The comparison of mortality during hospital stay among sampled patients with and without mitral regurgitation was that out of 53 cases of mitral regurgitation 39.62%(n=21) and out of 112 cases without mitral regurgitation 9.82%(n=11) had mortality during hospital stay, (p =0.000).

CONCLUSION: The occurrence of mitral regurgitation is higher after acute myocardial infarction and on comparison the frequency of mortality during hospital stay among sampled patients with mitral regurgitation is significantly higher than without mitral regurgitation.

KEYWORDS: Myocardial infarction, mitral regurgitation, mortality

INTRODUCTION

30% of mortality is related to ischemic heart disease. The new epidemic in developing world is of cardiovascular disease (CVD).[1-4] Cardiac mortality varies substantially between countries and ethnic groups.[5] Although part of this variation may be explained by differences in healthcare system and regional differences, prompt and improved treatment modalities has led to this dramatic decrease in mortality.[2-3] Identification of short and long term prognostic features and characteristics are essential to triage the patient with the need of care in resource scarce settings, like ours. Among various others factors, the presence of MR after STEMI(myocardial infarction) has been shown as a prognostic indicator of mortality in these patients.[6-7]

On analysis of approximately 725 patients in a previous study showed 12% mortality due to significant mitral regurgitation.[7] Gervasio A. Lames et al, reported high mortality rate secondary to MR (29% versus 12%).[10] These findings were also shown by Li et al.[9] The role of MR after myocardial infarction in determining the short term in hospital outcome has not been studied extensively in last five years.

There is no local appreciable data showing the prevalence of mitral regurgitation after acute myocardial infarction and its relation with in-hospital mortality. As data varies from population to population.[7-8]

The aim of this study was to elaborate the magnitude of regurgitation of mitral valve after the myocardial infarction and to determine the role of presence of mitral regurgitation regarding in hospital mortality.

MATERIAL & METHODS:

This was a descriptive case series carried out in the Cardiology department of Punjab Institute of Cardiology, Lahore during a period of six months after the approval from ethical board. From January 2018 to June 2018. Consecutive non-probability sampling was done. 165 cases were estimated with confidence level of 95% with margin of error 5% and taking 12% as expected percentage of MR.[7] Patients with age 20-75 years, regardless of gender and patients with first episode of myocardial infarction (as per operational definition: ST-elevation (STEMI) or non-STEMI. STEMI was defined by all of the following: ST segment elevation in two contiguous ECG leads (>2mm in chest leads, >1mm in limb leads, raised biomarkers (CPK >600 U/L, CKMB >72U/L, Troponin -T result positive) and history of Ischemic chest pain for more than 30 minutes. While non STEMI was labeled as raised biomarkers (CPK>600 U/L, CKMB, >72 U/L, Troponin -T result positive if more than 100pg/dl) with chest pain and ST segment depression or T-wave inversion in two contiguous leads) presenting with a first 24 hours of onset of chest pain. Patients who refused to consent for study participation, with renal failure (serum creatinine on admission>1.1mg/dL), having rheumatic heart disease and with history of cardiothoracic surgery were excluded. Demographics characteristics were recorded. Echo was conducted during first 24 hours and presence or absence of mitral regurgitation (It was determined by echocardiography using GE vivid-7 system, within 72 hours of admission showing grade-II/moderate or more mitral regurgitation was labeled as per operational definition). Patients were followed during hospital stay i.e. 7 days. Mortality during hospital stay (It was labeled if the patients died within first 7 days of hospital admission) was noted among patients with and without mitral regurgitation. Age, presence of shock at presentation, uncontrolled diabetes, and left ventricular ejection fraction were the confounding variables and addressed by stratification of the groups.

DATA ANALYSIS PROCEDURE:

Version 21 of SPSS was used to collect the data. Variables like age etc. were represented as mean ± standard deviation. Variables (Qualitative) like gender and presence or absence of mitral regurgitation were represented as frequencies and percentages. The frequency and percentage of outcome during hospital stay, shock at admission, uncontrolled diabetes, LVEF<30% was recorded and compared among patients with and without regurgitation of mitral valve. Variables like age, gender, diabetes mellitus, shock and ejection fraction were stratified and Chi square test was applied to see the level of significance after stratification. 0.05p value was significant.

RESULTS:

In our study, 45.45%(n=75) were having age of 20-50 years and 54.55%(n=90) were having age of 51-75 years. The mean of age was 53.93±10.29 years. (Table No. 1) Males were 52.73% (n=87) and females were 47.27% (n=78). (Table No. 2) Uncontrolled diabetes mellitus was present in 58.18%(n=96) while 41.82%(n=69) had controlled diabetes mellitus. (Table No. 4) Frequency of regurgitation of mitral valve after MI was recorded in 32.12%(n=53) while 67.88%(n=112) had no MR. (Table No. 2)

Table-1: Distribution of age (n=165)

Age(years)	Number of patients	Percentages
20-50	75	45.45
51-75	90	54.55
Total	165	100
Mean+sd	53.93+10.29	

Table-2: Distribution of variables (n=165)

		No. of patients	%
Gender	Male	87	52.73
	Female	78	47.27
Mitral regurgitation	Yes	53	32.12
	No	112	67.88

Table-3: Frequency of presence of shock at presentation (n=165)

Shock at presentation	No. of patients	%
Yes	38	23.03
No	127	76.97
Total	165	100

Table-4: Frequency of uncontrolled diabetes (n=165)

Uncontrolled diabetes mellitus	No. of patients	%
Yes	96	58.18
No	69	41.82
Total	165	100

Table-5: Frequency of LVEF<30% (n=165)

LVEF<30%	No. of patients	%
Yes	45	27.27
No	120	72.73
Total	165	100

Table-6: Comparison of mortality during hospital stay in patients with and without mitral regurgitation (n=165)

In-hospital mortality	Mitral regurgitation (n=53)		No mitral regurgitation (n=112)	
	No. of patients	%	No. of patients	%
Yes	21	39.62	11	9.82
No	32	60.38	101	90.18
Total	53	100	112	100

P value= 0.000

Table-7: Stratification of variables for mortality during hospital stay in patients with and without mitral regurgitation (n=165)

Mitral Regurgitation		In hospital mortality	
		Yes	No
20-50 years	Yes	9	14
	No	12	40
51-75 years	Yes	4	26
	No	7	53
LVEF less than 30%	Yes	11	34
	No	0	0
LVEF greater than 30%	Yes	0	8
	No	21	91

Comparison of mortality during hospital stay among sampled patients with and without mitral regurgitation shows that out 53 cases of mitral regurgitation 39.62%(n=21) and out of 112 cases without mitral regurgitation 9.82%(n=11) had in-hospital mortality,(p value 0.000). (Table No. 7-10)

Table-8: Stratification for in-hospital mortality among sampled patients with and without mitral regurgitation with regards to gender (n=165)

Male	Mitral Regurgitation	In hospital mortality	
		Yes	No
	Yes	8	19
	No	9	51

P value= 0.11

Female	Mitral Regurgitation	In hospital mortality	
		Yes	No
	Yes	5	21
	No	10	42

P value= 1.00

Table-9: Stratification for in-hospital mortality among sampled patients with and without mitral regurgitation with regards to uncontrolled diabetes mellitus (n=165)

Controlled	Mitral Regurgitation	In hospital mortality	
		Yes	No
	Yes	4	14
	No	6	45

P value= 0.27

Un-Controlled	Mitral Regurgitation	In hospital mortality	
		Yes	No
	Yes	8	27
	No	13	48

P value= 0.86

Table-10: Stratification for in-hospital mortality among sampled patients with and without mitral regurgitation with regards to shock at presentation (n=165)

Shock at presentation	Mitral Regurgitation	In hospital mortality	
		Yes	No
	Yes	11	27
	No	2	13

P value= 0.23

No shock at presentation	Mitral Regurgitation	In hospital mortality	
		Yes	No
	Yes	0	0
	No	19	93

P value= Chi square cannot applied

DISCUSSION:

In cardiac emergencies, acute coronary syndrome is the commonest. Out of which acute myocardial infarction is quite prevalent. Mechanical complications can occur after MI i.e. mitral regurgitation and ventricular septal rupture. The presentation of these mechanical complications may vary. These may be asymptomatic and may lead to hemodynamic compromise. These compli-

cations are usually identified on echocardiography with colour Doppler. The reported incidence of regurgitation of mitral valve is quite high and is approximately 39%.[7] The present study was also carried out to see the presence of mitral regurgitation and its effect on mortality during hospital stay.

Different studies in the past have revealed a variable frequency of presence of MR after MI. [8-10] In angiographic series the prevalence is about 20% while echocardiographic series it was reported to be 50%. [11-16] There are multiple factors which can affect the diagnostic procedure for the presence of MR. After MI, MR may be silent or may present with hemodynamic compromise. Mild to moderate MR after MI may remain as such or may worsen secondary to ischemia. So the diagnosis of presence of MR is very important. [17,18] In our study the patients with MR were pre dominant males. The frequency of uncontrolled diabetes and mortality secondary to MR were reported high. A previous study of 725 patients showed a mortality of 32% and presence of significant MR in 12% patients.[7]

In a study by Gervasio A. Lames et al, the mortality due to MR was also reported high (29% versus 12%).[10] In a study by Li et al, an independent correlation was present between MR and long term mortality (hazard ratio (HR) 1.58, 95% CI 1.01-2.47, P=0.043; HR 1.90, 95% CI 1.15-3.12, p

value 0.013).[9] The short term outcome of MR after AMI has not been extensively studied in the past. These findings are similar to the findings to our study. The above findings are showing correspondence with the findings reported in our study.

Syed Farhat Abbas Shah and other authors included approximately 5120 patients with MI. They reported higher prevalence of male and MR was present in 30% of the patients. Approximately 44% patients received thrombolysis and half of them developed mechanical complications including VSR and MR. Out of these patients, anterior wall MI was most common. The mortality during hospital stay was reported around 17% which is lower than that reported in the current study. In our study presence of MR after MI was 32.12% which is quite high and the study will lead to better risk stratification of patients who present with MI and mechanical complications.

Similar kind of the studies should be carried out in multiple centers and large volume of cases to improve the reliability of results.

CONCLUSION:

The frequency of mitral regurgitation is higher after acute myocardial infarction and on comparison the frequency of mortality during hospital stay among sampled patients with MR is significantly higher than without mitral regurgitation.

REFERENCES

1.Myocardial infarction redefined--a consensus document of The Joint European Society of Cardiology/American College of Cardiology Committee for the redefinition of myocardial infarction. J Am Coll Cardiol. 2000;36(3):959–69.

2.Norris RM. Dissent from the consensus on the redefinition of myocardial infarction. Eur Heart J.2001;22(17):1626–27.

3.Meier MA, Al-Badr WH, Cooper JV. The new definition of myocardial infarction: diagnostic and prognostic implications in patients with acute coronary syndromes. Arch Intern Med. 2002 Jul 22;162(14):1585–89.

4.Koukkunen H, Penttila K, Kemppainen A. Differences in the diagnosis of myocardial infarction by troponin T compared with clinical and epidemiologic criteria. Am J Cardiol. 2001;88(7):727–31.

5.Salomaa V, Ketonen M, Koukkunen H. Trends in coronary events in Finland during 1983–1997. The FINAMI study. Eur Heart J. 2003 Feb;24(4):311–19.

6.Rosamond WD, Chambless LE, Folsom AR. Trends in the incidence of myocardial infarction and in mortality due to coronary heart disease. New England Journal of Medicine. 1998;339:861–67.

7.Jugdutt BI. Ventricular remodeling post-infarction and the extracellular collagen matrix. When is enough? Circulation 2003;108:1395–403.

8.Jugdutt BI. Remodeling of the myocardium and potential targets in the collagen degradation and synthesis pathways. Curr Drug Targets Cardiovasc Haematol Disord 2003;3:1–30.

9.Li B, Wu H, Sun H, Xu J, Song Y, Wang W et al. Long-term outcomes of mitral valve annuloplasty versus subvalvular sparing replacement for severe ischemic mitral regurgitation. Cardiol J 2019;26(3):265-274.

10.Gervasio A. Lamas, Gary F. Mitchell, Greg C. Flaker, Sidney C. SmithJr, Bernard J. Gersh, Lofty Basta et al. Clinical Significance of Mitral Regurgitation After Acute Myocardial Infarction. Circulation. 1997;96:827–833

11.Hutchins GM, Bulkley BH. Infarct expansion versus extension: two different complications of acute myocardial infarction. AmJ Cardiol 1978;41:1127–32.

12.Hochman JS, Bulkley BH. Pathogenesis of left ventricular aneurysms: an experimental study in the rat model. Am J Cardiol 1982;50:83–8.

13.Weisman HF, Bush DE, Mannisi JA. Cellular mechanisms of myocardial infarct expansion. Circulation 1988;78:186–201.

14.Jugdutt BI, Jelani A, Palaniyappan A. Agingrelated changes in markers of ventricular and matrix remodeling after reperfused ST-segment elevation myocardial infarction in the canine model. Effect of early therapy with an angiotensin II type 1 receptor blocker. Circulation 2010;122:341–51

15.Oyama J, Blais C Jr, Liu X. Reduced myocardial ischemia-reperfusion injury in toll-like receptor 4-deficient mice. Circulation 2004;109:784–9.

16.Chong AJ, Shimamoto A, Hampton CR. Toll-like receptor 4 mediates ischemia/reperfusion injury of the heart. J Thorac Cardiovasc Surg 2004;128:170–9

17.Van de Werf F, Bax J, Betriu A, Blomstrom-Lundqvist C, Crea F. "Management of acute myocardial infarction in patients presenting with persistent ST-segment elevation: the Task Force on the Management of ST-Segment Elevation Acute Myocardial Infarction of the European Society of Cardiology". Eur. Heart J. 2008;29(23):2909–45.

18.Shawl FA, Forman MB, Punja S, Goldbaum TS. Emergent coronary angioplasty in the treatment of acute ischemic mitral regurgitation: long-term results in five cases. J Am Coll Cardiol 1989;14:986.

19.Shah SFA, Abdul Hadi Muhammad Faheem, Ikramullah. Frequency of mechanical complications in patients with Acute Myocardial Infarction. Pak Heart J 2013;46(02):86-90.