

Association of Right Ventricular Infarction in Patients with Inferior Wall Myocardial Infarction

Muhammad Sarwar Khalid¹, Usama Munir¹, Sana Naz², Alina Saqib³, Jawed Iqbal⁴ and Mazhar ul Haque⁵

ABSTRACT

Objective: Inferior wall myocardial infarction (MI) which presents hypotension is highly suggestive of associated Right ventricular (RV) Infarction leading to high mortality, therefore demand special precautions in its management. We conducted this study to see this potentially lethal combination of inferior wall MI with RV infarction.

Study Design: Descriptive cross sectional study.

Place and Duration of Study: This study was conducted at the Department of Cardiology, Bahawalpur Victoria Hospital, Bahawalpur, during 23rd September 2015 to 22nd March 2016.

Materials and Methods: This study was conducted at Department of Cardiology, Bahawalpur Victoria Hospital, Bahawalpur. It's a descriptive, cross sectional study comprises of 87 patients who were diagnosed on admission as inferior wall myocardial infarction of age 30-60 years of either gender were included. Patients with anterior wall MI, Left bundle branch block, cor-pulmonale, pulmonary hypertension and renal failure were excluded. In all patients standard twelve ECG along with right sided chest leads was performed and evaluated for association of RV infarction.

Results: Mean age was 52.55 ± 9.27 years. Number of male patients was 68 (78.16%) and females were 19 (21.84%) in the study with ratio of 3.6:1. Right ventricular infarction was found in 35 (40.23%) patients, whereas 52 (59.77%) patients had no associated RV infarction.

Conclusion: This study showed that inferior wall MI is significantly associated with RV infarction.

Key Words: Myocardial infarction, inferior wall, right ventricular infarction.

Citation of article: Khalid MS, Munir U, Naz S, Saqib A, Iqbal J, Haque M. Association of Right Ventricular Infarction in Patients with Inferior Wall Myocardial Infarction. Med Forum 2019;30(10):69-72.

INTRODUCTION

Unstable angina (UA), ST-elevation myocardial infarction (STEMI) and non-ST-elevation are components of Acute Coronary Syndrome (ACS)¹. Myocardial Infarction (MI) results from ischemia leading to necrosis and death of cardiac myocytes due to ischemia, which results from sudden occlusion or blockage of blood supply to myocardium.

The occurrence of ST-segment elevation on ECG in STEMI signifies complete occlusion of a coronary artery threatening the death and necrosis of myocardium^{2,3}.

These days Coronary Artery disease has become major cause of death in our region and Worldwide^{4,5}, more than 3 million people suffer from STEMI⁶. Similarly is hemic heart disease is becoming the second most important cause of morbidity and leading cause of mortality by 2030. Right ventricular infarct is suspected in sub set of patients who present with right ventricular failure, venous congestion and hypotension despite fair or normal ejection fraction⁷. Because of unique anatomical physiological features Right and left ventricles differ markedly in metabolic demands and response to ischemic insults and hence behave differently to myocardial infarction and other cardiac diseases. RV infarction usually occurs in the setting of acute inferior wall MI, however rarely ventricular infarction may also occur⁸. When a patient of inferior wall MI demonstrates distended neck veins along with clear lung basis, RV infarction must be suspected. Dependence of LV and overall cardiac function on RV function speaks the significance of RV infarction. Inferior wall infarction is associated with 34% incidence RV infarction⁹. As occurrence of RV

¹. Department of Cardiology, QAC, Bahawalpur.

². Department of Anatomy, RSMC, Tando Adam.

³. Department of Anatomy, CMH Medical College Bahawalpur.

⁴. Department of Biochemistry, Al-Tabri Medical College Karachi.

⁵. Department of Anatomy, Shahida Islam Medical College Lodhra.

Correspondence: Dr. Mazhar Ul Haq Department of Anatomy, Shahida Islam Medical College Multan-Bahawalpur Road Lodhran.

Contact No: 0331 3565277

Email: drmazhar79@gmail.com

Received: July, 2019

Accepted: September, 2019

Printed: November, 2019

infarction along with inferior wall infarction is associated with worse outcome including significant hypotension, Brady arrhythmias requiring pacing and increased in hospital mortality. Therefore the rationale was to evaluate the frequency of RV infarction in patients with inferior wall MI. The results would also add up the data in existing literature and also provide the local stats of the problem. Moreover, it would also help the physicians to improve the diagnostic and treatment strategies which may lead to better prognosis with reduction in morbidity and mortality in our population.

MATERIALS AND METHODS

The study comprises of 87 patients and was conducted at Department of Cardiology, Bahawalpur Victoria Hospital, Bahawalpur; during 23rd September 2015 to 22nd March 2016. This was a descriptive cross sectional study. After taking the informed consent case s was selected using non-probability, consecutive sampling criteria. Patients presented with Inferior wall MI of less than 24 hours duration of both genders were included in the study while patient with other types of myocardial infarction, Left bundle branch block (LBBB) on ECG, cor pulmonale, suspected pulmonary embolism, and those not willing for study were excluded from study. In all patients ECG and 2D echocardiography was done and his/her ECG was evaluated by a senior Cardiac physician for presence or absence of RV infarction. Collected data was analyzed by using SPSS version 20. Quantitative variables like age, height, weight, BMI and duration of disease were used to calculate Mean and standard deviation. Qualitative variables like gender, smoker, hypertension, diabetes mellitus, and dyslipidemia and right ventricular infarction were used to calculate Frequency and percentage. Effect modifiers like age, gender, duration of disease, BMI, smoker, hypertension, dyslipidemia and diabetes mellitus were controlled through stratifications. Post-stratification Chi square was applied to see their effects on the outcome and p value ≤ 0.05 was considered as significant.

RESULTS

Mean age of study population was 52.55 ± 9.27 years with age ranges between 30 to 60 years. Most of the patients 43 (49.43%) were between 51 to 60 years of age as shown in Table I

Table No.1: Distribution of patients according to age (n=87)

Age (years)	Total	
	No. of patients	%age
31-40	09	10.34
41-50	35	40.23
51-60	43	49.43
Total	87	100.0

Mean \pm SD= 52.55 ± 9.27 years

Table No.2: Distribution of patients with status of other confounding variables

Confounding variables		Frequency	%age
Diabetes Mellitus	Yes	29	33.33
	No	58	66.67
Hypertension	Yes	35	40.23
	No	52	59.77
Smoking	Yes	39	44.83
	No	48	55.17
Dyslipidemia	Yes	19	21.84
	No	68	78.16

Similarly 68 (78.16%) were male and 19 (21.84%) were females with ratio of 3.6:1. Mean duration of symptoms was 5.52 ± 3.83 hours. Frequency of patients with status of diabetes mellitus, hypertension, smoking and dyslipidemia has shown in Table II. Mean height was 165.33 ± 12.56 cm. Mean weight was 82.78 ± 9.69 kg. Mean duration of symptoms was 27.48 ± 5.64 kg/m². Right ventricular infarction was found in 35 (40.23%) patients, whereas there was no right ventricular infarction in 52 (59.77%) patients. When Stratification was done on age groups and gender, it was found that there was no statistically significant difference of right ventricular

Table No.3: Stratification of right ventricular infarction with respect to age groups

Age (years)	Right ventricular infarction		p-value
	Yes	No	
31-40	03 (33.33%)	06 (66.67%)	0.893
41-50	14 (40.0%)	21 (60.0%)	
51-60	18 (41.86%)	25 (58.14%)	

Table No.4: Stratification of right ventricular infarction with respect to gender

Gender	Right ventricular infarction		p-value
	Yes	No	
Male	28 (41.18%)	40 (58.82%)	0.733
Female	07 (36.84%)	12 (63.16%)	

Table No.5: Stratification of right ventricular infarction with respect to duration of symptoms

Duration of symptoms	Right ventricular infarction		p-value
	Yes	No	
1-6 hours	29 (44.62%)	36(55.38%)	0.152
7-23 hours	06 (27.27%)	16(72.73%)	

Infarction between different age groups and genders as shown in Table III & IV respectively while the stratification of duration of symptoms has shown in Table V which also showed no significant difference.

Stratification of right ventricular infarction with respect to confounding variables i.e. diabetes mellitus, hypertension, smoking, dyslipidemia and BMI was shown in Table VI. Respectively and p-value was found >0.05 which is statistically insignificant.

Table No.6: Stratification of right ventricular infarction with respect to Diabetes Mellitus

Diabetes Mellitus	Right ventricular infarction		p-value
	Yes	No	
Yes	15 (51.72%)	14 (48.28%)	0.122
No	20 (34.48%)	38 (65.72%)	

DISCUSSION

Isolated inferior myocardial infarction causes less myocardial damage and dysfunction and usually considered to have good prognosis. Its incidence is about 40-50 % of all myocardial infarctions with mortality only 2-9%. However associated conditions/complications may worsen the favorable outcome leading to worse prognosis^{10,11}. Brady arrhythmias, hypotension mitral regurgitations from papillary muscle dysfunction of mitral valve, apical ventricular septal rupture, right ventricular infarction and hypotension are well described complication of inferior myocardial infarction. Previously right ventricular infarction was considered as clinically unimportant association, however now it's well recognized event effecting the morbidity and mortality. Right ventricular infarction is seen in 25-52% of patients with inferior wall MI. Rarely RV infarction is also seen (13%) in patients with anterior wall MI. Moreover isolated right ventricular infarction is found only in less than 3% of cases. Because of thin RV myocardial wall it bears ischemic conditions better than LV and hence less incidence of RV infarction as compared to LV infarction^{12,13}. Many studies suggest that early recognition and proper management strategies may significantly improve the prognosis¹⁴. However low threshold for RVI is needed while considering the presentation and clinical characteristic patients for early detection and management of the Condition¹⁵.

Mean age of study population was 52.55 ± 9.27 years with age range between 30 to 60 years. Most of the patients 43 (49.43%) were between 51 to 60 years of age. Similarly 68 (78.16%) were male and 19 (21.84%) were females with ratio of 3.6:1. RV infarction was found in 35 (40.23%) patients, whereas there was no RV infarction in 52 (59.77%) patients.

In a similar local study Khan et al⁹ showed 34% occurrence of RVI in patients presenting with IWMI. Patients in RVMI group have more smoking and diabetes as compared to isolated IWMI having more hypertension and family history as risk factors. RVMI group showed poor prognosis with higher in hospital mortality (23.5%) as compared to isolated IWMI group

(18.1%). RV infarction was found in approximately one-third of IWMI. Their study results clearly demonstrated that presence of right ventricular infarction leads to significantly increased morbidity and mortality, suggesting high risk group of patients demanding special management and care.

Different ways of diagnosing RV infarction discussed in literature includes right sided ECG, coronary angiography, technetium ^{99m}, hemodynamic measurements and autopsy¹⁶. Right sided ECG is the easiest way of diagnosing RVI with high sensitivity and specificity¹⁷. In a study¹⁹ using right sided leads incidence rate of 54% was reported based on elevated ST-segments in lead V4R. Its sensitivity was shown to be 88%, specificity 78% and diagnostic accuracy 87%. Similarly in a study of 198 patients²⁰, the frequency of RVI on the basis of elevated ST Segments in right precordial leads i.e. V4R was 48.5% and in leads V3R to V6R, it was 40.5%.

Another study comprising of 50 patients showed results and findings similar to our study. In this study 30 had isolated inferior wall infarction and 20 patients had associated RV infarction (40%). Minimum age of the patient was 32 years and the maximum age was 78%. Maximum number of patients was in 51-70 years age group. The mean age was 55.66 ± 33 years. Male patients were 40 and females were 10.70% were smokers 20 patients had hypertension and 11 patients had dyslipidaemia, 12 had diabetes mellitus and 5 had family history of ischemic heart disease²⁰. Therefore on the whole, it is concluded that the frequency of RV in patients with inferior wall MI is high. It is also evident that association of RV infarction with inferior wall MI makes the patients high risk to have a worse prognosis than those who do not have right ventricular involvement, therefore its early detection with prompt and specific management is vital in reducing the mortality.

CONCLUSION

The results of this study suggest that there is a high frequency of RV infarction in patients with inferior wall MI in our population. As these patients have worse prognosis owing to hypotension, Brady arrhythmias and poor response to inotropic medicines and assist devices with increased in-hospital mortality than isolated inferior infarctions, we recommend that timely detection and treatment of RV infarction should be done in inferior wall MI patients in order to improve the prognosis in our patients.

Author's Contribution:

Concept & Design of Study: Muhammad Sarwar Khalid

Drafting: Usama Munir, Sana Naz
Data Analysis: Alina Saqib, Jawed Iqbal, Mazhar Ul Haq

Revisiting Critically: Muhammad Sarwar
Khalid, Usama Munir
Final Approval of version: Muhammad Sarwar

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Thygesen K, Alpert JS, White HD. Universal definition of myocardial infarction; a statement from the AHA/ESC/WHF/ACCF task force for the definition of myocardial infarction. *Circulation* 2007;116:26-34.
2. Van de Werf F, Bax J, Betriu A, Blomstrom-Lundqvist C, Crea F, Falk V, et al. 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):2909-945
3. Hamm CW, Bassand JP, Agewall S, Bax J, Boersma E, Bueno H, et al. ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: The Task Force for the management of acute coronary syndromes (ACS) in patients presenting without persistent ST-segment elevation of the European Society of Cardiology (ESC). *Eur Heart J* 2011;32(23):2999-3054
4. Khan NR, Mallick IA. Economic situation in Pakistan. *National Health Survey of Pakistan. Pak J Med Res* 1992;31:282-8.
5. Roger V, Go AS, Lloyd-Jones DM, Benjamin EJ, Berry JD, Borden WB, et al. *Heart Disease and Stroke Statistics--2012 Update: A Report from the American Heart Association. Circulation* 2012.
6. White HD, Chew DP. Acute myocardial infarction. *Lancet* 2008;372(9638):570-84.
7. Lupi-Herrera E, González-Pacheco H, Juárez-Herrera U. Primary reperfusion in acute right ventricular infarction: an observational study. *World J Cardiol* 2014;6(1):14-22.
8. Khan IS, Malik MN, Afzal M. The effect of right ventricular infarction on clinical outcome of inferior wall myocardial infarction. *Ann Pak Inst Med Sci* 2013;9(2):91-4.
9. Khan S, Kundi A, Sharieff S. Prevalence of right ventricular myocardial infarction in patients with acute inferior wall myocardial infarction. *Int J Clin Pract* 2004;58(4):354-7.
10. Berger PB, Ryan TJ: Inferior myocardial infarction: high risk groups. *Circulation* 1990; 81:401-411.
11. Zehender M, Kasper W, Kauder E: right ventricular infarction as an independent predictor of prognosis after acute inferior myocardial infarction. *N Eng J Med* 1993;328:981-988.
12. George S, Patel M, Thakkar A. Clinical profile and in-hospital outcome of patients with right ventricular myocardial infarction. *Intl J Clin Med* 2014;5:459-63.
13. Iqbal A, Muddarangappa R, Shah SKD, Vidyasagar S. A study of right ventricular infarction in inferior wall myocardial infarction. *J Clin Sci Res* 2013;2:66-71.
14. Chockalingam A, Gnanavelu G, Subramaniam T, Dorairajan S, Chockalingam V. Right ventricular myocardial infarction: presentation and acute outcomes. *Angiol* 2005;56:371-6.
15. Kosuge M, Kimura K, Ishikawa T, Hongo Y, Shigemasa T, Sugiyama M, et al. Implications of the Absence of ST-Segment Elevation in Lead V4R in Patients Who Have Inferior Wall Acute Myocardial Infarction with Right Ventricular Involvement. *Clin Cardiol* 2001; 24: 225-30.
16. Wackers FJ, Lie KI, Sokole EB. Prevalence of right ventricular infarction in inferior wall infarction assessed by myocardial imaging with thallium-201 and technetium-99m pyrophosphate. *Am J Cardiol* 1978;42:358-363.
17. Croft CH, Nicod F, Corbett JR. Detection of acute right ventricular infarction by right precordial electrocardiography. *Am J Cardiol* 1982;50:421-7.
18. Tamborini G, Brusoni D, Torres Molina JE, Galli CA, Maltagliati A, Muratori M, et al. Feasibility of a new generation three-dimensional echocardiography for right ventricular volumetric and functional measurements. *Am J Cardiol* 2008;102:499-505.
19. Kosuge M, Kimura K, Ishikawa T, Hongo Y, Shigemasa T, Sugiyama M, et al. Implications of the Absence of ST-Segment Elevation in Lead V4R in Patients Who Have Inferior Wall Acute Myocardial Infarction with Right Ventricular Involvement. *Clin Cardiol* 2001; 24: 225-30.
20. Memon AG, Shah MI, Devrajani BR, Baloch S. Incidence of right ventricular infarction in patients with acute inferior wall infarction. *J Postgrad Med Inst* 2015; 29(3): 189-92.