

## Influence of smoking on the location of acute myocardial infarction

Dr ABDUL LATIF

Dr IFTIKHAR AHMED

Dr MUHAMMAD HASHIM

*Assistant professor, Department of cardiology BMC*

Dr SYED ABDUL BARI

*Assistant professor, Department of Cardiology BMC*

Dr DOST MUHAMMAD

*Assistant professor, Cardiology, SPH Quetta*

Dr FAZAL UR REHMAN

*Associate professor, Department of cardiology BMC*

### Abstract

**Introduction:** *Acute inferior wall MI frequently involves the right ventricle (RV). Post mortem studies revealed that there is RV infarction in 19% to 51% of patients with acute inferior MI. RV infarction contributes markedly to hemodynamic instability, atrioventricular (AV) conduction blocks and in-hospital mortality in patients with inferior MI. Patients with inferior MI, who have RV infarction, appear to have a worse prognosis than those who don't have RV infarction.*

**Objectives:** *To determine the frequency of Influence of smoking on the location of acute myocardial infarction*

**Materials & Methods:** *This descriptive, cross sectional study done at department of cardiology at Bolan Medical College. From 12-12-2022 to 13-06-2023, a total of 110 patients with new onset inferior wall myocardial infarction of age 30-80 years of either gender were included. Patients with history of previous myocardial infarction, history of PCI, coronary artery bypass grafting, implanted defibrillators/pacemakers and ferromagnetic intracranial metallic implants and CRF were excluded. Informed consent was taken from each patient. Then demographic details (name, age, gender, DM, HTN, smoking, dyslipidaemia) were noted. After this, right ventricular infarction (as per-operational definition) was noted in each patient.*

**Results:** *Age range in this study was from 30 to 80 years with mean age of 55.49± 11.79 years. Majority of the patients 59 (53.64%) were between 51 to 80 years of age. Out of the 110 patients, 88 (80.0%) were male and 22 (20.0%) were females with ratio of 4:1. In my study, frequency of right ventricular infarction in inferior wall myocardial infarction patients was found in 43 (39.09%) patients.*

**Conclusion:** *This study concluded that the frequency of right ventricular infarction in patients with inferior wall ST elevation myocardial infarction is quite high.*

**Keywords:** myocardial infarction, inferior wall, right ventricular infarction.

### INTRODUCTION

Coronary artery disease remains the major curse of mankind, inspite of a lot of developments in diagnosis, management and prevention. Population surveys done in the last few decades indicate that the prevalence of coronary artery disease has

increased at least two folds in last twenty years in both urban and rural population in India. In urban adult population between 25 and 65 years of age, prevalence of CAD appears to be about 90/1000 people. CAD is less common in rural population compared to urban population.<sup>1</sup> Inferior wall myocardial infarction accounts for 40-50% of all acute myocardial infarctions and are generally viewed as having a better prognosis than Anterior wall MI. The mortality ranges from 2-9%. Nearly 50% of patients who suffer from inferior wall MI will have complications that will substantially alter an otherwise favorable prognosis.<sup>2,3</sup>

The World Health Organization estimated in 2004, that 12.2% of worldwide deaths were from ischemic heart disease;<sup>4</sup> with it being the leading cause of death in high- or middle-income countries and second only to lower respiratory infections in lower-income countries.<sup>4</sup> Worldwide, more than 3 million people have STEMIs and 4 million have NSTEMIs a year.<sup>5</sup> STEMIs occur about twice as often in men as women.<sup>6</sup> Globally, disability adjusted life years (DALYs) lost to ischemic heart disease are predicted to account for 5.5% of total DALYs in 2030, making it the second-most-important cause of disability (after unipolar depressive disorder), as well as the leading cause of death by this date.<sup>4</sup>

Right ventricular infarction was first recognized in a subgroup of patients with inferior wall myocardial infarctions who demonstrated right ventricular failure and elevated right ventricular filling pressures despite relatively normal left ventricular filling pressures.<sup>7</sup> Increasing recognition of right ventricular infarction, either in association with left ventricular infarction or as an isolated event, emphasizes the clinical significance of the right ventricle to total cardiac function.<sup>8</sup> Looking into the pathogenesis of the disease, right and left ventricles differ markedly in their anatomy, mechanics, loading conditions, and metabolism, and therefore it should not be surprising that they have strikingly different oxygen supply and demand characteristics and thus manifest disparate responses to ischemic insults.<sup>9,10</sup>

Acute inferior wall MI frequently involves the right ventricle (RV). Post mortem studies revealed that there is RV infarction in 19% to 51% of patients with acute inferior MI.<sup>4</sup> RV infarction contributes markedly to hemodynamic instability, atrioventricular (AV) conduction blocks and in-hospital mortality in patients with inferior MI.<sup>5</sup> Patients with inferior MI, who have RV infarction, appear to have a worse prognosis than those who don't have RV infarction.<sup>6</sup> In a local study done by Memon AG et al<sup>7</sup>, frequency of right ventricular infarction in inferior wall MI patients was found to be 48.5%. Another local study has shown this percentage as 24.0%.<sup>8</sup> In one more Pakistani study, frequency of right ventricular infarction in inferior wall MI patients was found to be 36.67%.<sup>9</sup> Another study has shown this percentage as 40.0%.<sup>10</sup>

Although previously international as well as local study is available on this topic but as mentioned above, the local studies have shown large variation in frequency of right ventricular infarction in inferior wall MI patients. So there must be re-evaluation of the data to get the updated evidence in local setting and implement screening and management of right ventricular infarction in inferior wall MI patients.

## **MATERIALS & METHODS**

### DATA COLLECTION PROCEDURE

After approval from ethical review committee, 110 patients presenting to the inpatient Department of Cardiology, Bolan Medical College Quetta, fulfilling the inclusion criteria were selected. Informed consent was taken from each patient. Then demographic details (name, age, gender, DM, HTN, smoking, dyslipidaemia) were noted. After this, right ventricular infarction (as per-operational definition) was noted in each patient. All this data was recorded on proforma.

### DATA ANALYSIS PROCEDURE

All the data was analysed using SPSS version 25. Mean and standard deviation were calculated for age and duration of inferior wall MI. Frequency and percentage were calculated for gender, DM, HTN, smoking, dyslipidaemia and right ventricular infarction (present/absent).

Stratification was done for age, gender, duration of inferior wall MI, DM, HTN, smoking and dyslipidaemia. Post-stratification chi square was applied to see their effect on right ventricular infarction and p-value  $\leq 0.05$  was taken as significant.

### RESULTS

Age range in this study was from 30 to 80 years with mean age of  $55.49 \pm 11.79$  years. Majority of the patients 59 (53.64%) were between 51 to 80 years of age as shown in Table I. Out of the 110 patients, 88 (80.0%) were male and 22 (20.0%) were females with ratio of 4:1 (Figure II). Mean duration of symptoms was  $5.40 \pm 3.56$  hours (Figure III). Frequency of patients with status of diabetes mellitus, hypertension, smoking and dyslipidemia has shown in Table II.

In my study, frequency of right ventricular infarction in inferior wall myocardial infarction patients was found in 43 (39.09%) patients as shown in Figure IV. When Stratification was done on age groups and gender, it was found that there was no statistically significant difference of right ventricular 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 and dyslipidemia was shown in Table VI, VII, VIII & IX respectively.

**Table-I: Distribution of patients according to age (n=110).**

Age (years)	Total	
	No. of patients	%age
30-55	59	53.64
56-80	51	46.36
Total	110	100.0

Mean  $\pm$  SD =  $55.49 \pm 11.79$  years

**Figure-II: Distribution of patients according to gender (n=110).**

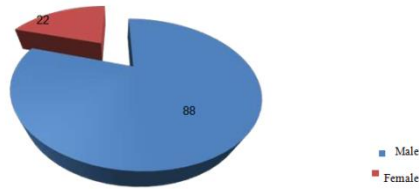


Figure III: Distribution of patients according to duration of symptoms (n=110).

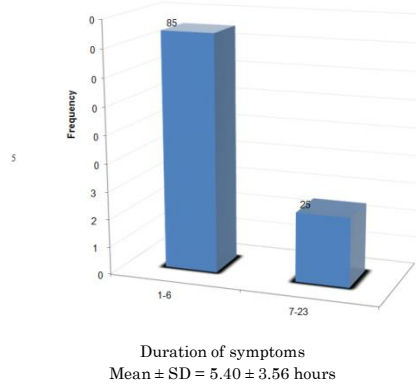


Table II: Distribution of patients with status of other confounding variables.

Confounding variables		Frequency	%age
Diabetes Mellitus	Yes	34	30.91
	No	76	69.09
Hypertension	Yes	41	37.27
	No	69	62.73
Smoking	Yes	54	49.09
	No	56	50.91
Dyslipidemia	Yes	19	17.27
	No	91	82.73

Figure IV: Frequency of right ventricular infarction in inferior wall myocardial infarction patients (n=110).

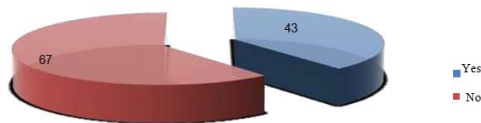


Table III: Stratification of right ventricular infarction with respect to age groups.

Age (years)	Right ventricular infarction		p-value
	Yes	No	
30-55	19	40	0.111
56-80	24	27	

Table IV: Stratification of right ventricular infarction with respect to gender.

Gender	Right ventricular infarction		p-value
	Yes	No	
Male	36	52	0.434
Female	07	15	

**Table V: Stratification of right ventricular infarction with respect to duration of symptoms.**

Duration of symptoms	Right ventricular infarction		p-value
	Yes	No	
1-6 hours	37	48	0.079
7-23 hours	06	19	

**Table VI: Stratification of right ventricular infarction with respect to Diabetes Mellitus.**

Diabetes Mellitus	Right ventricular infarction		p-value
	Yes	No	
Yes	18	16	0.046
No	25	51	

**Table VII: Stratification of right ventricular infarction with respect to Hypertension.**

Hypertension	Right ventricular infarction		p-value
	Yes	No	
Yes	21	20	0.044
No	22	47	

**Table VIII: Stratification of right ventricular infarction with respect to Smoking.**

Smoker	Right ventricular infarction		p-value
	Yes	No	
Yes	20	34	0.665
No	23	33	

**Table IX: Stratification of right ventricular infarction with respect to Dyslipidemia.**

Dyslipidemia	Right ventricular infarction		p-value
	Yes	No	
Yes	07	12	0.825
No	36	55	

## DISCUSSION

Inferior wall myocardial infarction accounts for 40-50% of all acute myocardial infarctions and are generally viewed as having a better prognosis than Anterior wall MI. The mortality ranges from 2-9%. Nearly 50% of patients who suffer from inferior wall MI will have complications that will substantially alter an otherwise favorable prognosis.<sup>12-17</sup> Once considered rare and clinically unimportant, right ventricular infarction is now a recognized clinical event. Right ventricular infarction is seen in 25-52% of patients with inferior wall MI. It has been reported that RV infarction is also seen in 13% of patients with anterior wall MI. Isolated right ventricular infarction is found in less than 3% of cases. Clinical evidence have shown that RV infarction as a major negative prognostic factor in patients with inferior wall MI and its early recognition and proper treatment reduces the morbidity and mortality.<sup>18-19</sup>

Age range in this study was from 30 to 80 years with mean age of 55.49 ± 11.79 years. Majority of the patients 59 (53.64%) were between 51 to 80 years of age. Out of the 110 patients, 88 (80.0%) were male and 22 (20.0%) were females with ratio of 4:1. In my study, frequency of right ventricular infarction in inferior wall myocardial

infarction patients was found in 43 (39.09%) patients. In a local study done by Memon AG et al<sup>7</sup>, frequency of right ventricular infarction in inferior wall MI patients was found to be 48.5%. Another local study has shown this percentage as 24.0%.<sup>8</sup> In one more Pakistani study, frequency of right ventricular infarction in inferior wall MI patients was found to be 36.67%.<sup>9</sup> Another study has shown this percentage as 40.0%.<sup>10</sup>

In another study of the 50 patients, 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 numbers of patients were 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 disease.<sup>20</sup> Jha et al had done similar study in 1988 where the incidence of RV infarction was 37.5%. Approximately 19% of the patients with 2nd and third degree heart blocks develop complication in inferior wall MI.<sup>12</sup>

In a study of 198 patients, 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%.<sup>21</sup> Masami K et al<sup>22</sup> showed ECG evidence of RVI as the most accurate, simple and easiest with an incidence of 30 -50%. In patients with inferior wall MI the incidence of RVI was found to be 30%, based on ECG evidence of ST-Segment elevation in V4R, in the study by Croft CH et al.<sup>23</sup> Recently electrocardiographic evidence of RVI was proved by four diagnostic procedures autopsy, coronary angiography, technetium 99m and hemodynamic measurements. An incidence rate of 54%<sup>23</sup> was reported based on elevated ST- segments in lead V4R. Its sensitivity was shown to be 88%, specificity 78% and diagnostic accuracy 87%.

In a largest prospective study, based on coronary angiography, elevated ST-segments in lead V4R was present in 32% of all patients with acute inferior wall MI.<sup>24</sup> In a study, RVI was evident in 32% of cases with inferior wall MI.<sup>25</sup> A similar prevalence of RVI of 30%<sup>10</sup> and 37%<sup>27</sup> has been reported in other studies in patients with inferior wall MI. RVI is less common since RV is less susceptible to ischaemia as oxygen demand is significantly lesser because of its smaller muscle mass<sup>28,29</sup> and coronary perfusion in right ventricle occurs in both systole and diastole.<sup>30</sup> In another study<sup>31</sup> of 42 inferior wall MI patients, 16 had echocardiography evidence suggestive of RV dilatation; this included 12 with V4R evidence of RVI. Patients with inferior wall myocardial infarction (IWMI) who have right ventricular myocardial involvement appear to have a worse prognosis than those who do not have right ventricular involvement.<sup>32,33</sup>

Khandait V et al. had found 45 (30%) out of 150 cases of IWMI to be having right ventricular involvement.<sup>32-34</sup> Ravikeerthy M et al. observed the incidence at 40%.<sup>34</sup> Memon AG et al. observed that out of 198 cases with IWMI, 96 (48.5%) cases had evidence of RVMI.<sup>35</sup> Iqbal A et al. found 16 (32%) cases of IWMI to be having right ventricular involvement.<sup>36</sup> Thus, the author's findings concerning the incidence of RVMI in IWMI are mostly supportive of the available evidence. RVI is less common since the right ventricle is less susceptible to ischemia as oxygen demand is significantly lesser because of its smaller muscle mass, and coronary perfusion in the right ventricle occurs in both systole and diastole.<sup>38-39</sup>

In a local study, patients with acute inferior wall myocardial infarction (IWMI) admitted to the National Institute of Cardiovascular Diseases, Karachi, Pakistan. Between August 2000 and May 2001, a total of 100 patients with acute IWMI

were enrolled. There were 86 (86%) males and 14 (14%) females. Mean age was 56.3 +/- 13.13 years (range 33-83 years). The prevalence of RVMI in IWMI was 34%. Smoking and diabetes were more prevalent in RVMI group, while hypertension and family history of ischemic heart disease were more common in isolated IWMI. Ninety per cent of patients received thrombolytic therapy. In-hospital mortality (23.5%) was higher in RVMI group than isolated IWMI (18.1%). Other major complications were also higher in RVMI group than isolated IWMI. Right ventricular infarction was found in approximately one-third of IWMI. Right ventricular infarction was associated with considerable morbidity and mortality, and its presence defines a higher risk subgroup of patients with inferior wall left ventricular infarction.<sup>11</sup>

## CONCLUSION

This study concluded that frequency of right ventricular infarction in patients with inferior wall ST elevation myocardial infarction is quite high. So, we recommend that timely detection and treatment of right ventricular infarction should be done in inferior wall myocardial infarction patients in order to reduce the mortality and morbidity of community.

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