Comparison of In-hospital Acute Inferior Wall Myocardial Infarction Outcomes in Elderly Patients with and without the Right Ventricular Involvement

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ABSTRACT

Objective: The major aim of the current study is to determine the in-hospital outcomes of acute inferior wall myocardial infarction (IWMI) in elderly patients with the presence and absence of right ventricular myocardial infarction (RVMI).

Study Design: A comparative cross-sectional study

Place and Duration of Study: This study was conducted at the department of Cardiology in Ch. Pervaiz Elahi Institute of Cardiology Multan from March 2020 to March 2021 for a period of one-year.

Materials and Methods: A cross-sectional study was designed using a sample size of 165 elderly patients with IWMI. The study was performed using a one-year patient's data from Chaudhary Pervaiz Elahi Institute of Cardiology, Multan. Both male and female IWMI patients with age's ≥60 years were considered for the study. Baseline data and risk factors were recorded for all patients after the informed consent. The older IWMI patients were categorized into two groups namely, the RVMI and non-RVMI groups respectively. In-hospital outcomes such as serious complications, cardiogenic shocks, complete AV blockage, ventricular tachycardia and in-hospital deaths were monitored.

Results: Out of total 165 IWMI patients, 80 (48%) patients had RVMI whereas, the remaining 85 (52%) were non-RVMI patients. Our results show that RVMI is an important determinant of the in-hospital outcomes such as serious complications (76%), shock (48%), cardiogenic shocks (36%), complete AV blockage (38%) and in-hospital death rates (53%) in the elderly IWMI patients.

Conclusion: Our study has shown that the RVI in older IWMI patients lead to frequent complications thus exacerbating and aggravating the in-hospital outcomes of acute IWMI due the increased risk of shocks, serious complications, cardiogenic shocks, complete AV blockage and in-hospital deaths.

Key Words: Acute Inferior wall myocardial infarction (IWMI), Right ventricular myocardial infarction (RVMI), in-hospital outcomes, coronary artery disease (CAD), acute coronary syndrome (ACS), cardiogenic shock (CS), anterior wall myocardial infarction (AWMI)

INTRODUCTION

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Regardless of the remarkable advancements achieved in the treatment and administration of coronary artery disease (CAD), it remains the major reason for the fatalities occurring globally [1,2]. Most prominently, the Acute coronary syndrome (ACS) is the severest demonstration of CAD resulting in high mortality rates thus, concerning around 5 to 8% of the patients within a six month duration of diagnosis [3]. ACS manifests a broader range of disease conditions related to the abrupt and reduced blood flow to the heart mainly due to the obstructions or narrowing of the coronary arteries [4, 5]. Unstable angina, cardiac arrest, electrical instability with cardiogenic shock (CS), non-ST elevation myocardial infarction and ST-Elevation myocardial infarction are the other clinical presentations associated with ACS [5, 6].

Moreover, the interrupted blood supply causes the necrosis of myocytes thus leading to the acute ST elevation myocardial infarction (STEMI). Depending on the vessel supplying blood to a particular area, the STEMI can be concomitant to the lateral, posterior, inferior or anterior walls of left ventricle [6]. Generally, a destructive course has been indicated for the anterior wall myocardial infarction (AWMI). Whereas, an inferior wall myocardial infarction (IWMI) can also pose serious risks when occurring in concomitance with the right ventricle myocardial infarction (RVMI) [7]. The complications in the form of RVMIs are mainly evident subsequent to the STEMI [8]. Moreover, a greater association of RVMI with the higher morbidity and mortality rates at earlier stages has been reported frequently in literature [8-10].

Particularly, the acute inferior wall myocardial infarction (IWMI) constitutes about 40%-50% of the total myocardial infarctions that are acute in nature. The IWMIs display better prognosis (both short and long term) with mortality rate of ~ 2% to 9% in comparison to the AWMIs [11-14]. Approximately 20-50% of all acute IWMIs are reported to be complicated by the RVMI and a poor prognosis is observed for the acute IWMI when it is complicated by the RVMI [14, 15]. Various studies have reported different in-hospital outcomes of IWMIs either with the presence or absence of the RVMI [16-18]. Literature reports differences being observed in the documented in-hospital outcomes of patients of IWMI with and without RVMI. Therefore, the present study was designed for the elucidation of in-hospital outcomes of IWMI patients with the presence and absence of RVMI mainly in the elderly population of South Punjab. The study will aid the comparative analysis of the in-hospital outcomes in elderly patients. Herein, our study focuses on the older patients as they are amongst the subgroups of acute inferior myocardial infarction patients that are at a greater risk. Moreover, the RVMIs clinical implications in elderly patients have been studied to a limited extend previously.

MATERIALS AND METHODS

A comparative cross-sectional study with a sample size of 165 elderly patients with IWMI was conducted using one year from 2nd March 2020 to 2nd March 2021 patients data from the Chaudhary Pervaiz Elahi Institute of Cardiology, Multan. Both male and female IWMI patients with age's ≥60 years were considered for the study. Patients were excluded from the study sample on the basis of a CCU admission time greater than 48 hours, repolarization abnormalities in V3R or V4R, bundle-branch blockage and those with pacemaker cardiac rhythm. These criteria were used for final sample selection as the patients with the described conditions are not adequate or suitable for the assessment of size and function of the right ventricle. Additionally, patients with myocardial infarction, chronic obstructive pulmonary disease, renal failure and chronic liver disease histories were also omitted from the study sample.

The screening and analysis of IWMI was performed if a prolonged chest pain lasted above 30 minutes along with a ST segment elevation of about 0.1 mv or above in two or more electrocardiographic (ECG) inferior leads including II, III, and aVF leads. However, the presence of RVMI in patients was diagnosed at an ST-segment elevation of 0.1 mV or above in the precordial leads of the right side i.e. V3R or V4R leads. The baseline data was collected to analyze the in-hospital outcomes of IWMI patients after an informed consent. Gender, age, patient's body mass index (BMI) and cardiovascular risk factors including diabetes, hypertension, smoking, chest pain and dyslipemia were considered for each patient as shown in Table 1. The selected IWMI patients were divided into groups on the base of the absence or presence of a concomitant RVMI in accordance with the operational definition provided by the consultant cardiologist using the clinical history, physical examination and the ECG result.

Data Analysis: Data analysis was performed using the software SPSS 20.0. Median values were calculated for the selected continuous variables. For quantitative variables (i.e. age and BMI) mean and standard deviation values were calculated. For qualitative variables such as cardiovascular risk factors (i.e. hypertension, diabetes, cigarette smoking, dyslipemia and chest pain) frequency and percentages were calculated. Two tests including the $\chi 2$ test and Wilcoxon U test were used for the analyzing the significance of proportions and the comparison of means of the studied variables. The independent weightage of RVMI was evaluated using multiple logistic regression analysis. Two tailed probability values were used for the current study and a P-values $\leq$ 0.05 were considered to be statistically significant.

RESULTS

The mean values for the age and BMI of the patient sample (n=165) included in the study were 69.90±8.04 years and 25.01±3.36 kg/m^2 respectively. About 48% (n=80) patients with inferior wall acute myocardial infarction (IWMI) were diagnosed with RVMI and the remaining 52% (n=85) patients were characterized with the absence of the RVMI. No significant differences were observable in the baseline demographic and clinical presentations of patients from both groups i.e. RVMI and non-RVMI IWMI patients as shown in Table 1. The in-hospital outcomes of patients have shown that a greater number of IWMI patients displayed serious complications, both shock and cardiogenic shocks and complete AV blockage (Table 2). The implications of in-hospital outcomes for both RVMI and non-RVMI IWMI patients are presented in Table 2. However, the in-hospital fatality rates were

higher (53%) for IWMI patients with RVMI and lower (25%) for IWMI patients without RVMI. The results from the multiple logistic regression analysis reveal that the RVMI is an important independent predictor of in-hospital deaths in older IWMI patients.

Table No.1: Baseline demographic data of Inferior wall myocardial infarction (IWMI) patients with and without RVMI

	RVMI	Non-RVMI	P
Sample size	**(n=80)**	**(n=85)**	
Age (years)	82 (60-85)	75(61-87)	0.07
Sex (Male/Female)	(48/32)	(53/32)	0.85
Hypertension n (%)	43 (54)	52 (61)	0.97
Diabetes mellitus n (%)	30 (38)	28 (33)	0.32
Cigarette smoking n (%)	28 (35)	27 (32)	0.19
Dyslipemia n (%)	20 (25)	25 (31)	0.70
Chest pain, n (%)	70 (88)	76(89)	0.99

Table No.2: The in-hospital outcomes for IWMI patients with and without RVMI (N=165)

Occurrence	RVMI	Non-RVMI	*P*
Sample size	(n=80)	(n=85)	
Serious complications n(%)	61 (76)	39 (45)	0.0001
Pulmonary congestion n(%)	20 (25)	29 (34)	0.73
Shock n(%)	38 (48)	11(13)	0.0001
Cardiogenic shock n(%)	29 (36)	9 (11)	0.0001
Complete AV blockage n(%)	30 (38)	15 (18)	0.0001
Ventricular tachycardia n(%)	15 (19)	8 (9)	0.046
Arrhythmias (Supraventricular) n(%)	20(25)	18 (21)	0.54
Death n(%)	42(53)	20 (25)	0.0001

DISCUSSION

It is reported that a destructive course has been indicated for the anterior wall myocardial infarction (AWMI), however, the inferior wall myocardial infarction (IWMI) can also pose serious risks when occurring in concomitance with the right ventricle myocardial infarction (RVMI) [7]. Thus, a greater association of RVMI with the higher morbidity and mortality rates at an earlier stage has been reported frequently in literature where, RVMI incidence is reported to be approximately 10-50% [8-10, 19, 20]. Previously, various IWMI subgroups with higher risks have been defined and it is also reported that older IWMI patients have worse outcomes in comparison to younger IWMI patients [11, 21, 22]. Moreover, the clinical implications of RVMI in older IWMI patients have been previously investigated on a limited scale.

Therefore, in the present study we assessed the effect of RVMI in older patients with IWMI and it is shown that a poor diagnosis is displayed by older IWMI patients with RVMI in comparison to the non-RVMI patients. Patients implicating significant RVMI might represent hypotension, shock or a higher incidence of in-hospital complications [23, 24].Our results also show that RVMI is a strong determinant of the in-hospital outcomes such as serious complications (76%), shock (48%), cardiogenic shocks (36%), complete AV blockage (38%) and in-hospital death rates (53%). Our results in terms of the studied variables are well in line with the study outcomes of Zehender et al and Bueno et al [10, 16]. Various studies without the consideration of age factor have reported the occurrence of cardiogenic shock to be within 8 to 49% [25-27]. However, taking in to consideration the age of patients, we report the incidence of the cardiogenic shock (36%) within the reported range. Moreover, a higher death rate is observable for elderly IWMI patients considered in the current study. Ali et al, reported incidence of ventricular tachycardia (VT) and mortality rate of about 30.30% and 21.6% respectively in IWMI patients with RVMI. However, in the current study a lower incidence of ventricular tachycardia (VT) (19%) and a higher mortality rate (53%) has been reported for older patients [28]. Moreover, similar to our study, poor outcomes in IWMI patients with RVMI are reported by Ali et al, in comparison to the non-RVMI patients [28]. Similar to our study, Zahender and coworkers have also reported higher death rates (31%) and a poor prognosis in IWMI patients with RVMI [10].

In conclusion it shown by the current study that RVMI in older IWMI patients leads to frequent complications thus exacerbating the in-hospital outcomes of acute IWMI due the increased risk of shocks, cardiogenic shock, serious complications, complete AV blockage and in-hospital deaths. Besides this the current study might display certain limitations since the study is observational in nature thus, it might lack some relevant functional and clinical information. Therefore, there is an extensive need to explore and understand the pathophysiological mechanisms of cardiogenic shocks in older IWMI patients with RVMI.

CONCLUSION

Our study has shown that the RVMI in older IWMI patients lead to frequent complications thus exacerbating and aggravating the in-hospital outcomes of acute IWMI due the increased risk of shocks, serious complications, cardiogenic shocks, complete AV blockage and in-hospital deaths.

Author's Contribution:

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

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