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Original Research Article

Outcome-Based Comparison of Patients with Myocardial Infarction with and Without Respiratory Tract Infections

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Abstract: *Myocardial infarction (MI) remains a leading cause of morbidity and mortality globally. Coexisting systemic conditions such as respiratory tract infections (RTIs) may worsen clinical outcomes due to heightened inflammatory and metabolic stress.* ***Objective:*** *To compare in-hospital outcomes of patients with MI in the presence and absence of concurrent respiratory tract infections.* ***Methods:*** *This comparative cross-sectional study was conducted at Fauji Foundation Hospital, Lahore from 10 August 2024 to 15 March 2025. A total of 455 patients admitted with a confirmed diagnosis of MI were enrolled over the study period using a non-probability consecutive sampling technique. All patients aged 18 years and above who were diagnosed with ST-elevation myocardial infarction (STEMI) or non-ST-elevation myocardial infarction (NSTEMI), based on clinical presentation, electrocardiographic findings, and elevated cardiac biomarkers (troponin I/T or CK-MB), were eligible for inclusion.* ***Results:*** *Patients with RTIs were older and had higher rates of diabetes and hypertension ($p < 0.05$). In-hospital mortality was significantly higher in the RTI group (16.1% vs. 7.3%, $p = 0.006$), with longer hospital stays (7.4 ± 2.6 vs. 5.6 ± 2.1 days, $p < 0.001$), greater ICU admissions (32.1% vs. 14.6%, $p < 0.001$), and more frequent mechanical ventilation (19.6% vs. 6.1%, $p < 0.001$). RTI patients also had increased incidence of acute heart failure (29.5% vs. 17.2%, $p = 0.004$) and arrhythmias (22.3% vs. 13.1%, $p = 0.01$). On multivariate analysis, RTI was an independent predictor of in-hospital mortality (AOR: 2.38; 95% CI: 1.25–4.51) and ICU admission (AOR: 2.91; 95% CI: 1.73–4.91).* ***Conclusion:*** *It is concluded that concurrent respiratory tract infections in patients with myocardial infarction are associated with significantly poorer in-hospital outcomes. These findings emphasize the importance of early recognition, aggressive management, and possibly preventive strategies such as vaccination in MI patients at risk of infection.*

Keywords: Myocardial Infarction, Respiratory Tract Infection, Heart Failure, Comorbidity, Inflammation

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Introduction

Myocardial infarction (MI), also known as a heart attack, remains one of the leading causes of death and disability globally, accounting for significant health system burdens and economic costs. According to the World Health Organization, ischemic heart diseases are responsible for approximately 9 million deaths annually (1). MI occurs either suddenly or gradually due to a blockage in the coronary blood vessels, usually because of plaque rupture and the forming of a blood clot. Recognizing the problem and proper treatment are needed to help patients, but various patient and hospital factors can strongly impact the outcomes after cardiac surgery. One important aspect that is not fully understood is the existence of multiple infections affecting the airways (RTIs) at one time (2). Upper respiratory illnesses such as pharyngitis and sinusitis, bronchitis, influenza and community-acquired pneumonia can complicate the delicate condition of patients suffering from cardiovascular diseases (3). Health problems caused by RTIs are most severe in low- and middle-income countries, where exposure to the environment, limited access to vaccines and late diagnosis are regular. Respiratory infections can cause the whole body to become inflamed which can disturb the atherosclerotic buildup in the blood vessels, thicken the blood and damage the endothelium, as these issues lead to the development of MI (4). A number of observational studies and reports have identified an increase in MI each year when influenza is most common which suggests influenza may lead to cardiovascular issues (5). In the same cases, C-reactive protein (CRP), interleukin-6 (IL-6) and fibrinogen are often raised which can increase the chances of cardiac complications together (6). Also, infections can cause irregular heart rhythms, low blood pressure, shock or additional heart disease, especially in patients with existing heart ischemia (7). More energy is used by the body; breathing becomes more difficult and sympathetic activity increases during infections which can further harm the heart (8). According to clinical data, people with myocardial infarction and an infection spend more time in the hospital, require ICU admission more often and are more likely to experience complications like heart failure, shock and sudden cardiac death (9). According to the study done by Corrales-Medina et al., having pneumonia independently raised the risk for both short- and long-term cardiovascular issues such as MI and heart failure. This shows why it is important to watch for and manage RTIs as soon as possible in heart patients (10).

To compare in-hospital outcomes of patients with MI in the presence and absence of concurrent respiratory tract infections.

Methodology

This comparative cross-sectional study was conducted at Fauji Foundation Hospital, Lahore from 10 August 2024 to 15 March 2025. A total of 455 patients admitted with a confirmed diagnosis of MI were enrolled over the study period using a non-probability consecutive sampling technique. All patients aged 18 years and above who were diagnosed with ST-elevation myocardial infarction (STEMI) or non-ST-elevation myocardial infarction (NSTEMI), based on clinical presentation, electrocardiographic findings, and elevated cardiac biomarkers (troponin I/T or CK-MB), were eligible for inclusion.

Participants were categorized into two groups:

Group A: MI patients with coexisting respiratory tract infection (RTI), confirmed either clinically or via radiographic or laboratory findings.

Group B: MI patients without any evidence of RTI during the hospital stay.

RTIs were defined based on the presence of clinical symptoms (e.g., fever, cough, sputum production, or dyspnea), auscultatory findings (e.g., crackles, wheezes), radiographic evidence of infection (e.g., infiltrates, consolidation), and/or positive laboratory markers (e.g., elevated CRP,

procalcitonin, or a confirmed respiratory pathogen via PCR or culture). Clinical and demographic data were collected using a structured, pre-validated proforma. Information gathered was the patient's age, sex, body mass index, whether they had complications like diabetes, hypertension or dyslipidemia, if they smoked, if they had been vaccinated and if they were using any current medication. Included in clinical presentation were time between arriving at the hospital and blood test, Killip classification, multiple blood pressure measures, heart rate, oxygen saturation and any need for oxygen therapy. Tests performed in the laboratory were a complete blood count, levels of inflammation (CRP and procalcitonin), electrolytes in the serum, oxygen levels in the blood and cardiac enzymes (troponin I, CK-MB). The technician also noted any abnormalities seen in ECG and echocardiographic results. Included in the data were reperfusion approaches (eg, thrombolysis or percutaneous coronary intervention), antiplatelet drugs, statins, anticoagulation and any relevant use of antibiotics. The outcomes recorded in this study were in-hospital death, the total number of days in hospital and whether ICU admission or mechanical ventilation were needed. Other important results looked at sudden heart failure, arrhythmias such as atrial fibrillation and ventricular tachycardia, possible reinfarction during the first stay and how long patients required vasopressor treatment.

Data were entered and analyzed using SPSS v26. Continuous variables were presented as mean ± standard deviation (SD) or median with interquartile range (IQR), depending on the distribution as assessed by the Shapiro–Wilk test. Differences between the two groups were evaluated using the independent samples t-test. A p-value of less than 0.05 was considered statistically significant.

Results

Data were collected from 455 patients, with 112 in the MI + RTI group and 343 in the MI-only group. The mean age was significantly higher in the RTI group (67.2 ± 10.5 years) compared to the non-infected group (61.3 ± 11.7 years; $p < 0.001$). While the proportion of male patients was similar in both groups (68.8% vs. 70.3%, $p = 0.75$), comorbid conditions like diabetes (67.0% vs. 52.8%, $p = 0.01$) and hypertension (71.4% vs. 59.2%, $p = 0.02$) were significantly more prevalent in the infected cohort. No significant difference was observed in smoking status or type of MI (STEMI: 60.7% vs. 64.1%, $p = 0.53$).

Table 1: Baseline Characteristics

Variable	Group A (MI + RTI) (n=112)	Group B (MI only) (n=343)	p-value
Number of Patients	112	343	-
Mean Age (years)	67.2 ± 10.5	61.3 ± 11.7	<0.001
Male Gender (%)	68.8%	70.3%	0.75
Diabetes Mellitus (%)	67.0%	52.8%	0.01
Hypertension (%)	71.4%	59.2%	0.02
Smokers (%)	39.3%	42.1%	0.38
STEMI (%)	60.7%	64.1%	0.53
Killip Class ≥ II (%)	43.7%	28.3%	0.004

The in-hospital mortality rate was more than double in the RTI group (16.1% vs. 7.3%, $p = 0.006$). Additionally, the mean hospital stay was longer among infected patients (7.4 ± 2.6 days) compared to those without RTI (5.6 ± 2.1 days, $p < 0.001$). The need for ICU admission was substantially higher in the RTI group (32.1% vs. 14.6%, $p < 0.001$), and more patients required mechanical ventilation (19.6% vs. 6.1%, $p < 0.001$), highlighting the increased clinical burden of concurrent respiratory infections in MI cases.

Table 2: Primary Outcomes

Variable	Group A (MI + RTI)	Group B (MI only)	p-value
In-hospital Mortality (%)	16.1%	7.3%	0.006
Mean Length of Stay (days)	7.4 ± 2.6	5.6 ± 2.1	<0.001
ICU Admission (%)	32.1%	14.6%	<0.001
Mechanical Ventilation (%)	19.6%	6.1%	<0.001

Acute heart failure occurred in 29.5% of the RTI group versus 17.2% in the non-infected group ($p = 0.004$), and arrhythmias were also more frequent (22.3% vs. 13.1%, $p = 0.01$). Although reinfarction was slightly higher in the RTI group (5.4% vs. 3.2%), the difference was not statistically significant ($p = 0.29$). Notably, the duration of hemodynamic instability was significantly prolonged in patients with RTI (2.1 ± 1.3 days vs. 1.0 ± 0.8 days, $p < 0.001$), indicating greater circulatory compromise.

Table 3: Secondary Outcomes

Variable	Group A (MI + RTI)	Group B (MI only)	p-value
Acute Heart Failure (%)	29.5%	17.2%	0.004
Arrhythmias (%)	22.3%	13.1%	0.01
Reinfarction (%)	5.4%	3.2%	0.29
Hemodynamic Instability (days)	2.1 ± 1.3	1.0 ± 0.8	<0.001

Specifically, the odds of in-hospital mortality were significantly higher in the RTI group, with an adjusted odds ratio (AOR) of 2.38 (95% CI: 1.25–4.51, $p = 0.008$). Similarly, the likelihood of ICU admission was nearly three times greater in patients with RTI (AOR: 2.91, 95% CI: 1.73–4.91, $p < 0.001$), even after adjusting for confounding variables such as age, comorbidities, and MI severity.

Table 4: Multivariate Logistic Regression

Outcome	Adjusted Odds Ratio (AOR)	95% CI	p-value
In-hospital Mortality	2.38	1.25–4.51	0.008
ICU Admission	2.91	1.73–4.91	<0.001

Discussion

This study aimed to evaluate and compare in-hospital outcomes among myocardial infarction (MI) patients with and without concurrent respiratory tract infections (RTIs). Our findings demonstrate that RTIs significantly worsen the prognosis of MI patients, with increased rates of mortality, prolonged hospital stays, higher ICU admissions, and greater risk of complications such as heart failure and arrhythmias. The outcomes point to the clinical importance of infection in worsening heart disease. More than half of the MI + RTI patients passed away (16.1%) while still in the hospital which is much higher than the 7.3% of those without RTI. This is in agreement with studies observing a link between infection and increased heart complications (11). In agreement with the first report, Corrales-Medina et al. (2012) found that a history of cardiac disease made patients vulnerable to greater risk of death from pneumonia in both the short and long term. Infection may lead to systemic inflammation which contributes to plaque rupture, increased clotting and weak heart muscle, all of which increase heart disease risks. It can be seen from the data that infections make managing MI more complex, as patients with RTIs often required ICU admission (32.1% vs. 14.6%) and breathing support with a ventilator (19.6% vs. 6.1%). As seen in the work of Musher et al. (2007) such patients are at greater risk of cardiopulmonary issues and the need for more intensive care. The greater number of Killip class III and IV cases in infected patients in this study further proves the difficulty of heart

failure and unstable blood pressure that comes with coexisting infections (13).

Respiratory infections are linked to acute heart failure after MI because of several reasons. Conditions such as hypoxia, tachycardia and high levels of inflammatory cytokines TNF-α and IL-6 might increase problems with ventricular function and worsen ischemia. Heart failure occurred more often in the group treated for MI + RTI (29.5%), compared to those treated just for MI (17.2%), making the difference both significant and notable (14). Findings by Achour et al. agree with the emphasis of previous studies (Madjid et al.,) on the harmful effects of respiratory viruses to the heart, mostly in older and sick people. The infected cohort also had a much higher rate of heart arrhythmias (22.3% vs. 13.1%) (15). It is possible medically, since fever, oxygen loss and metabolic issues during infection may cause the heart to be more excitable and make arrhythmias more likely in both the atria and ventricles. Another notion is that abnormal regulating of ion channels as well as problems with autonomic balance may be involved (16).

Multivariate logistic regression found that having RTI predicted both in-hospital death and ICU admission, even after controlling for age, comorbidities and MI type. It proves that infections contribute independently to the poorer outcomes seen in acute coronary syndromes (17). Thus, when looking at patients with MI, clinicians should notice signs of RTIs such as dyspnea or general infection symptoms. As viral respiratory infections can harm the heart before and after COVID-19, our findings are very timely and useful (18). Our research did not identify particular pathogens, yet the high mortality and incident rate of complications in persons with any RTI indicates that such infections may broadly harm the heart. Some of the study's strengths involve a big group of patients and broad gathering of clinical information. Even so, it also has drawbacks. Since there is no comparison group, the observational design cannot draw causal conclusions.

Conclusion

It is concluded that the presence of respiratory tract infections significantly worsens in-hospital outcomes among patients with myocardial infarction. Patients with concurrent RTIs exhibited higher mortality rates, longer hospital stays, increased ICU admissions, and a greater frequency of complications such as heart failure and arrhythmias compared to those without infections. These associations remained significant even after adjusting for age, comorbidities, and MI subtype, indicating that respiratory infections independently contribute to adverse cardiovascular outcomes.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-24)

Consent for publication

Approved

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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

HC (Postgraduate Resident),
Review of Literature, Data entry, Data analysis, and drafting article. Manuscript drafting, Study Design,
MUZ (Postgraduate Resident)
Study Design, manuscript review, Data Analysis and literature search
MIM (Assistant Professor)
Conception of Study, critical input Development of Research Methodology Design

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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