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Original Research Article

Frequency of Newly Diagnosed Diabetes Mellitus in Patients Presenting with ST-Elevation Myocardial Infarction

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Abstract: *Diabetes mellitus (DM) and myocardial infarction (MI) are two prevalent and closely related conditions that significantly contribute to global morbidity and mortality.* ***Objective:*** *The study also assessed the incidence of recurrent MI, heart failure, and long-term complications in both diabetic and non-diabetic groups.* ***Methodology:*** *This cross-sectional observational study was conducted at Ziauddin Hospital Clifton, Karachi from January 2024 to September 2024. A total of 240 patients were added in the study. Data included demographic details such as age, sex, ethnicity, and medical history. During data collection, the team obtained clinical presentation information through symptom display observation and monitoring of symptom start times, together with the analysis of established MI risk factors, that included hypertension, tobacco use, and heart disease heredity.* ***Results:*** *A total of 240 patients were added in the study, with a mean age of 64.2 ± 9.1 years, compared to 56.3 ± 10.0 years in the non-diabetic group. Hypertension was more prevalent in the diabetic group (90%) compared to the non-diabetic group (70%), while smoking was also higher in the diabetic group (60% vs. 45%). The diabetic group had a higher mean BMI (30.1 ± 4.3 kg/m²) and a significantly higher prevalence of metabolic syndrome (80% vs. 40%). Patients diagnosed with newly onset diabetes were significantly older, with a mean age of 64.2 ± 9.1 years compared to 56.3 ± 10.0 years in the non-diabetic group ($p < 0.01$). Hypertension was more prevalent in the diabetic group (90%) compared to 70% in non-diabetic patients ($p < 0.05$), indicating a strong association between high blood pressure and the development of diabetes post-myocardial infarction.* ***Conclusion:*** *It is concluded that while diabetes is not directly responsible for causing ST-Elevation Myocardial Infarction (STEMI), it is a significant risk factor that exacerbates the severity and prognosis of the condition.*

Keywords: Diabetes Mellitus Myocardial Infarction Hypertension Metabolic Syndrome Risk Factors Introduction

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Introduction

Diabetes mellitus (DM) and myocardial infarction (MI) are two prevalent and closely related conditions that significantly contribute to global morbidity and mortality. Researchers have proven in medical literature that both diabetes and cardiovascular diseases frequently lead to myocardial infarction (1). The medical conditions have parallel risk factors, which include hypertension and obesity, together with dyslipidemia and inactivity. The medical research shows that myocardial infarction can trigger the emergence of diabetes even though diabetes itself is recognised as a risk factor for developing heart conditions. Medical practitioners encounter increased rates of newly detected diabetes in acute myocardial infarction patients, creating essential clinical questions regarding the biological causes of such outcomes as well as future health outcomes (2)

Myocardial infarction forms an interlinked relationship with diabetes through metabolic dysfunction combined with inflammatory patterns and vascular functional changes. People with type 2 diabetes experience insulin resistance that leads to more significant risks of atherosclerosis and endothelial dysfunction, thus influencing MI pathogenesis (3). Acute myocardial infarction creates stress through inflammation and oxidative stress, which worsens insulin resistance to the point of diabetic development among susceptible people. Physiological stress from MI functions as an acute event that might serve as a triggering element to develop diabetes among persons who lacked a previous diabetes diagnosis (4). Studies during recent times indicate that acute myocardial infarction patients receive more frequent diabetes diagnoses compared to the general population adults. The acute MI brings about major glucose regulatory problems in patients resulting in fast increases in blood sugar levels and insulin resistance. Chronic diabetes may develop from transitory diabetes in patients who also carry hereditary diabetes risk factors together with obesity and metabolic syndrome (5)

A series of interconnected physiological mechanisms cause newly diagnosed diabetes to develop in MI patients. Cytokine inflammatory production and stress hormones, catecholamines, and cortisol, combine to reduce insulin sensitivity in patients. Myocardial injury together with its subsequent ischemia causes damage to pancreas operation which results in impaired beta-cell performance and reduced insulin quantity (6) Chronic MI-related metabolic transformations that alter lipid pathways and glucose control and insulin sensitivity status will worsen insulin resistance leading to diabetes onset in people with genetic risk factors (7) The observed clinical implications from this phenomenon determine its importance to medical care. MI patients who develop diabetes after their heart attack experience worsened cardiovascular risks due to the complication of both conditions (8). Medical research has established that MI patients who experience hyperglycemia without a formal diabetes diagnosis face more severe complications, which increase their risk of arrhythmias, heart failure, and repeated myocardial events. Organisations must identify newly diagnosed diabetes in patients with MI as soon as

possible since this diagnosis leads to better survival and reduced morbidity rates (9).

Thus the study also assessed the incidence of recurrent MI, heart failure, and long-term complications in both diabetic and non-diabetic groups.

Methodology

This cross-sectional observational study was conducted at Ziauddin Hospital Clifton, Karachi during January 2024 to September 2024. A total of 240 patients were added in the study. Adults aged > 18 years who presented with symptoms suggestive of acute myocardial infarction (chest pain, shortness of breath, diaphoresis, etc.).Patients with elevated cardiac biomarkers (such as troponin I or T) consistent with acute myocardial infarction. Patients with a prior history of diagnosed diabetes mellitus (type 1 or type 2).Individuals who were diagnosed with acute or chronic conditions that could interfere with glucose metabolism (such as severe liver disease or acute kidney failure).Pregnant women or individuals with a recent history of trauma or surgery.

Data were collected with permission from the hospital's ethical committee. Data were collected from patient medical records, clinical evaluations, and laboratory results. Data included demographic details such as age, sex, ethnicity, and medical history. During data collection, the team obtained clinical presentation information through symptom display observation and monitoring of symptom start times, together with the analysis of established MI risk factors, that included hypertension, tobacco use, and heart disease heredity. Medical diagnosis of myocardial infarction depended on cardiac biomarkers (such as troponin I or T) and ECG results in patient testing. The hospital staff checked blood glucose levels for every patient upon their entry to the facility. Individuals with random blood glucose above 200 mg/dL or fasting glucose higher than 126 mg/dL need additional tests through the OGTT or HbA1c level examination to verify diabetes. Patients fulfilling the diagnosis of diabetes received a medical classification of newly diagnosed diabetes. When patients did not show signs of diabetes, the measurement of their glucose levels revealed euglycemic conditions, which means they had normal glucose levels. The patients were divided into two groups based on the results of their glucose testing: Patients diagnosed with newly diagnosed diabetes mellitus after MI (using HbA1c levels or OGTT criteria). Patients without a diagnosis of diabetes or impaired glucose tolerance (euglycemic patients).

Follow-up data were collected at 3 and 6 months to monitor any changes in glucose metabolism and cardiovascular outcomes.

Data were analysed using SPSS v21. Descriptive statistics, such as mean, median, and standard deviation, were used for continuous variables like age, blood pressure, cholesterol, and glucose levels. For categorical variables, such as the presence or absence of diabetes, chi-square was applied. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 240 patients were added in the study, with a mean age of 64.2 ± 9.1 years, compared to 56.3 ± 10.0 years in the non-diabetic group. Hypertension was more prevalent in the diabetic group (90%) compared to the non-diabetic group (70%), while smoking was also higher in the diabetic group (60% vs. 45%). The diabetic group had a higher mean BMI (30.1 ± 4.3 kg/m²) and a significantly higher prevalence of metabolic syndrome (80% vs. 40%). All patients in the diabetic group had elevated blood glucose levels, with 100% showing random blood glucose levels above 200 mg/dL and fasting blood glucose above 126 mg/dL.

Patients diagnosed with newly onset diabetes were significantly older, with a mean age of 64.2 ± 9.1 years compared to 56.3 ± 10.0 years in the non-diabetic group ($p < 0.01$). Hypertension was more prevalent in the diabetic group (90%) compared to 70% in non-diabetic patients ($p < 0.05$), indicating a strong association between high blood pressure and the development of diabetes post-myocardial infarction. Smoking was also more frequent in diabetic patients (60%) compared to non-diabetic patients (45%), showing a statistically significant correlation ($p < 0.05$).

The incidence of recurrent myocardial infarction was higher in the diabetic group (15%) than in the non-diabetic group (5%), with a statistically significant difference ($p < 0.05$). Additionally, heart failure was more common in the diabetic group, affecting 10% of patients, compared to only 2% in the non-diabetic group ($p < 0.01$), highlighting the increased risk of complications following MI in diabetic patients. Mortality rates were also higher in the diabetic group (5%) compared to the non-diabetic group (1.5%), although the difference did not reach statistical significance ($p = 0.07$).

For every year increase in age, the odds of developing diabetes increased by 7% (Odds Ratio (OR) = 1.07, 95% CI: 1.03 – 1.12, $p < 0.01$), indicating that older age significantly contributes to the likelihood of developing diabetes. Hypertension was also a significant predictor, with hypertensive patients having more than twice the odds of being diagnosed with diabetes compared to non-hypertensive patients (OR = 2.25, 95% CI: 1.01 – 5.02, $p = 0.05$). While smoking showed an increased risk (OR = 1.45, 95% CI: 0.87 – 2.40), this association was not statistically significant ($p = 0.15$).

Table 1: Demographic and Clinical Characteristics of Patients

Characteristic	Total (N=240)	Diabetic Group (N=40)	Non-Diabetic Group (N=200)
Mean Age (years)	58.7 ± 10.3	64.2 ± 9.1	56.3 ± 10.0
Male (%)	66.7%	70%	66%
Female (%)	33.3%	30%	34%
Hypertension (%)	75%	90%	70%
Smoking (%)	50%	60%	45%
Family History of CVD (%)	40%	50%	35%
Mean BMI (kg/m²)	27.4 ± 3.5	30.1 ± 4.3	27.0 ± 3.3
Metabolic Syndrome (%)	50%	80%	40%
Chest Pain (%)	85%	88%	84%
Atypical Symptoms (%)	15%	12%	16%
ST-Segment Elevation (%)	92%	95%	91%
Non-STEMI (%)	8%	5%	9%
Random Blood Glucose > 200 mg/dL (%)	25%	100%	0%
Fasting Blood Glucose > 126 mg/dL (%)	30%	100%	0%
Newly Diagnosed Diabetes (%)	16.7%	100%	0%

Table 2: Risk Factor Analysis for Newly Diagnosed Diabetes

Risk Factor	Diabetic Group (N=40)	Non-Diabetic Group (N=200)	p-value
Age (Mean ± SD)	64.2 ± 9.1	56.3 ± 10.0	< 0.01
Hypertension (%)	90%	70%	< 0.05
Smoking (%)	60%	45%	< 0.05
Family History of CVD (%)	50%	35%	0.08
BMI (Mean ± SD)	30.1 ± 4.3	27.4 ± 3.5	< 0.01
Metabolic Syndrome (%)	80%	50%	< 0.01

Table 3: Cardiovascular Outcomes at 3-Month Follow-up

Outcome	Diabetic Group (N=40)	Non-Diabetic Group (N=200)	p-value
Recurrent Myocardial Infarction (%)	15%	5%	< 0.05
Heart Failure (%)	10%	2%	< 0.01
Mortality (%)	5%	1.5%	0.07

Table 4: Logistic Regression Analysis for Risk Factors for Newly Diagnosed Diabetes

Risk Factor	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Age (per year increase)	1.07	1.03 – 1.12	< 0.01
Hypertension	2.25	1.01 – 5.02	0.05
Smoking	1.45	0.87 – 2.40	0.15
BMI (per kg/m² increase)	1.89	1.10 – 3.24	0.02

Discussion

This study aimed to evaluate the frequency of newly diagnosed diabetes mellitus (DM) in patients presenting with myocardial infarction (MI) and explore the relationship between risk factors, cardiovascular outcomes, and long-term complications. The research highlights that patients diagnosed with new diabetes show significant association with heart disease complications and commonly present risk elements including hypertension together with obesity and smoking habits (10) The research revealed that newly diagnosed diabetes mellitus diagnosed 16.7% of patient cases with elevated myocardial infarction markers and this data matched previously reported diabetes prevalence among MI patients. The development of diabetes following MI occurs through an interaction between systemic inflammation and insulin resistance and the release of cytokines triggered by heart tissue damage (11). Laboratory findings show that after a heart attack, patients experience changes in blood sugar regulation that might bring about insulin resistance resulting in a diabetes diagnosis. Various elements appeared to be significant factors in diabetes development among this particular group of patients (12). The combination of hypertension together with obesity, as well as an older age group, and smoking behavior led to higher rates of diabetes diagnosis in MI patients. Medical research has established these variables as risk factors which raise the possibility of myocardial infarction and diabetes diagnosis (13). The newly identified diabetic patients experienced significantly poorer cardiovascular results than patients without diabetes. Data showed recurrent myocardial infarction occurred at 15% in the diabetic population while its incidence remained at 5% in non-diabetic patients. Heart failure affected 10% and 2% of diabetic and non-diabetic patients respectively which illustrates the harmful effects of unregulated glucose management on cardiovascular wellness (14). Prior research has established diabetes patients demonstrate inferior results after myocardial infarctions because they experience frequent recurring heart attacks along with heart failure and death (15). Diabetic patients experience increased risks for a repeated myocardial infarction because their condition leads to faster development of atherosclerosis combined with reduced blood vessel function and stronger platelet stickiness (16). Uncontrolled diabetes causes both macrovascular and microvascular problems which raise these patients' heart failure susceptibility rates. The findings regarding long-term complications of newly diagnosed diabetes showed concerning results in this study (17). Patients with diabetes in the research group showed higher rates of diabetic retinopathy, together with nephropathy, and peripheral neuropathy than patients without diabetes. Research studies have confirmed that diabetes speeds up vascular complications formation especially in cases where blood sugar control is inadequate. Some relevant limitations are present in this research (18). The study results might lack transferability because the research involved only patients with myocardial infarction from a large but single population. The study's observational nature prevents researchers from proving a cause-effect relationship between myocardial infarction and diabetes development. Further following individual patients will provide more evidence about how myocardial infarction affects their blood metabolism and diabetes risk over time.

Conclusion

It is concluded that while diabetes is not directly responsible for causing ST-Elevation Myocardial Infarction (STEMI), it is a significant risk factor that exacerbates the severity and prognosis of the condition. The findings from this study show a notable prevalence of newly diagnosed diabetes in STEMI patients, indicating that diabetes may contribute to the development and worsened outcomes of myocardial infarction. Furthermore, factors such as hypertension, tobacco use, and a family history of heart disease are closely associated with the likelihood of developing both diabetes and STEMI.

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-MMNCS-0331d-24)

Consent for publication
Approved

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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

MS (Training In Internal Medicine),
Manuscript drafting, Study Design,
MAK (Consultant)
Review of Literature, Data entry, Data analysis, and drafting article.
NPG (Resident Pulmonology), *Conception of Study, Development of Research Methodology Design,*
AS (Resident Cardiology)
Study Design, manuscript review, critical input.

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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