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DIABETIC JEOPARDIZE OF ACUTE MYOCARDIAL INFARCTION CHEST PAIN

Gul Zaman Khan Niazi[1], Nisar Ahmed[1], Arslan Masood[2], Ammar Akhtar[1], Muhammad Sohail Saleemi[1], Ijaz Ahmad[1]

1 Chaudhry Pervaiz Elahi Institute of Cardiology, Multan, Pakistan
2 Allama Iqbal Medical College, Lahore, Pakistan

Address for Correspondence:
Dr. Gul Zaman Khan Niazi
Chaudhry Pervaiz Elahi Institute of Cardiology, Multan, Pakistan
Email: med_student62@yahoo.com

Contribution
GZKN conceived the idea and designed the study. Data collection and manuscript writing was done by GZKN, NA, AM, AA, MSS, and IA. All the authors contributed equally to the submitted manuscript.

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ABSTRACT

Objective: Diabetic neuropathy may mask the typical ischemic chest pain and diabetics may carry longer presentation times in cases of acute STEMI. Diabetics may complain of chest pain less frequently, while atypical clinical presentations of STEMI could be more common compared to non-diabetics. Aim of this study was to assess the potential impact of diabetes on STEMI related chest pain, its severity, characteristics and non-specific clinical features.

Methodology: The descriptive, cross-sectional study included 254 patients with first episode of STEMI. Data was acquired regarding feeling of chest pain, its severity, different characters, sites of radiation, and occurrence of associated clinical features. These variables were compared among diabetic and non-diabetic groups by Pearson's Chi-square test.

Results: Diabetics were more likely 'not to feel' any STEMI related chest pain compared to non-diabetics (22.2% vs. 2.4% p<0.001), severe chest pain was a less frequent complaint in diabetics compared to non-diabetics (21.1% vs. 89% p<0.001). The characters of "chest tightness", "strangulating pain" and "squeezing chest pain" were less frequent in diabetics (45.6% vs. 68.3% p<0.001, 8.9% vs. 56.7% p<0.001 and 1.1% vs. 18.3% p<0.001 respectively). Syncope and shortness of breath were observed more frequently in diabetics (37.8% vs. 20.7% p=0.003 and 23.3% vs. 17.1% p=0.001 respectively).

Conclusion: Diabetics can frequently present without pain or with less severe chest pain and infrequent typical characters compared to non-diabetics and may have atypical symptoms like syncope and shortness of breath more commonly than non-diabetics.

Keywords: Diabetes mellitus, ST-Elevation Myocardial Infarction, Chest pain, Ischemic heart disease

INTRODUCTION

ST-segment Elevation Myocardial infarction (STEMI) is among the leading causes of morbidity and mortality worldwide with more than nine million people suffering from ischemic heart disease (IHD).[1,2] Diabetes mellitus (DM) is one of the major modifiable risk factors for IHD and is also considered as an equivalent to coronary artery disease (CAD).[3] In addition to its major role in the development of atherosclerosis and CAD, it may frequently cause peripheral and autonomic neuropathy, vasculopathy and diabetic cardiomyopathy.[4]

Diabetes has been linked to a higher risk for CAD and almost twice short- and long-term mortality after STEMI compared to non-diabetics.[5] Around 20% diabetics have an abnormal cardiovascular autonomic function.[6] This could lead to the atypical presentations of myocardial ischemia and acute STEMI.[7] Associated peripheral neuropathy may mask the typical ischemic chest pain and diabetics have been shown to carry longer presentation times compared to non-diabetics in cases of acute STEMI.[5] Diabetics may complain of chest pain less frequently, while atypical clinical presentations of STEMI could be more common compared to non-diabetics.[8,9]

In cases of acute STEMI, myocardial salvage and mortality reduction depends largely on earliest reperfusion strategies.[10] About 18 to 40% patients present later than 12 hours of STEMI onset in European and North American well-developed systems of care.[11,12] Even more patients present late in the healthcare systems of developing countries.[13] In addition to the circumstantial, logistic, social and educational factors contributing to such delays, diabetes may contribute by masking the typical chest pain or discomfort so that a substantial proportion of persons suffering from acute STEMI may not attribute their symptoms to it at an early stage. The study was conducted to assess the potential impact of diabetes on STEMI related chest pain, its severity, characteristics and non-specific clinical features. Findings of the study could provide insight on how diabetes can mislead diabetic STEMI patients in recognizing their initial symptoms as well as pose difficulties to the first contact healthcare workers in diagnosing STEMI in its earliest phase while the electrocardiographic and biomarker evidences are still awaited. Important inferences drawn from the study could be incorporated into general population-based educational and social awareness programs in addition to further enlightening the first contact healthcare providers to consider the potential impact of diabetes while assessing possible STEMI patients.

METHODOLOGY

The descriptive, cross-sectional study was conducted in patients admitted in Emergency department of Cardiology unit of Chaudhary Pervaiz Elahi Institute of Cardiology, Multan for a period of six months. Total of 254 consecutive patients with first episode of STEMI were included in the study after approval from Ethical and Research Review Committee of the institute and informed consent from the patients.

Demographic parameters and CAD risk factor profiles were recorded. Questions were asked about the chest pain and its severity was graded via verbal rating scale of pain with score 1-4 as mild pain, 5-7 as moderate pain, 8-10 as severe pain. Specific characters of chest pain (pressure over precordium, strangulating pain, squeezing pain and burning over precordium) were also inquired. Patients were also asked about the radiation of chest pain or discomfort to left arm, both arms, neck, lower jaw, interscapular region, or epigastrium. Patients were then assessed for occurrence of associated clinical features to chest discomfort including episodes of vomiting, profuse sweating (all over the body, drenching clothes and irritating for the patient), syncope, shortness of breath, fits, and indigestion symptoms. Patients were labelled as diabetics if already on hypoglycemic drugs, HbA1C > 7.0 % or fasting blood glucose > 120 mg/dL.

All data was analyzed by computer software SPSS version 20. Demographics and STEMI types were assessed and stratified among diabetic and non-diabetic groups. Chest pain severities, characters, radiations and associated clinical features were compared among diabetic and non-diabetic groups by Pearson's Chi-square test.

RESULTS

The study included 90(35.4%) diabetics and 164 (64.6%) non-diabetics. Demographic features of study population are detailed in Table 1.

Table 1: Distribution of demographic features, other CAD risk factors and STEMI types among diabetic and non-diabetics

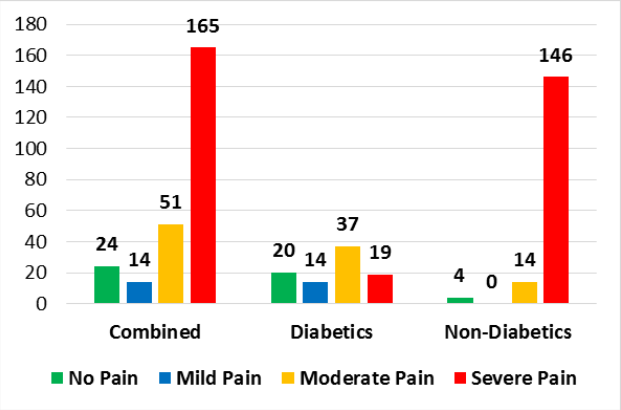
	Total	DM	Non-DM
N	254	90	164
Age(years)	54.8 ± 10.9	58.9 ± 9.3	52.7 ± 11.5
Males	183 (72%)	50 (55.6%)	131 (79.9%)
Females	71 (28%)	40 (44.4%)	33 (20.1%)
Dyslipidemia	101 (39.8%)	71 (78.9%)	30 (18.3%)
Hypertension	78 (30.7%)	31 (34.4%)	47 (28.7%)
Smoking	99 (39%)	20 (22.2%)	79 (48.2%)
FHx	82 (32.3)	32 (35.6%)	50 (30.5%)
Anterior STEMI	163 (64.2%)	54 (60%)	109 (66.5%)
Inferior STEMI	78 (30.7%)	33 (36.7%)	45 (27.4%)
Inferolateral STEMI	7 (2.8%)	3 (3.3%)	4 (4.5%)

DM: diabetics, FHx: Family history of coronary artery diseases, STEMI: ST elevation myocardial infarciton

Anterior STEMI was the most frequent type (64.2%) followed by inferior STEMI (30.7%) and inferolateral STEMI (2.8%). Diabetics were more likely 'not to feel' any STEMI related chest pain compared to non-diabetics (22.2% vs. 2.4%), a mild degree of chest pain was more frequent in diabetic group compared to non-diabetics (15.6 % vs. 0 %) while severe pain was a less frequent complaint in diabetics compared to non-diabetics (21.1 % vs. 89 %) (p<0.001) (Figure 1).

Regarding the character of chest pain, "chest tightness" was the most frequent character (60.2%). The characters of "chest tightness", "strangulating pain" and "squeezing chest pain" were less frequent in diabetics compared to non-diabetics (45.6% vs. 68.3% p < 0.001, 8.9% vs. 56.7% p<0.001 and 1.1% vs. 18.3% p<0.001 respectively) (Table 2). Frequencies of "pressure" and "burning sensation" over precordium were not significantly different among diabetics and non-diabetics (34.4% vs. 45.1% p=0.127 and 7.8% vs. 3% p=0.089 respectively) (Table 2).

Figure 1: Distribution of chest pain severity among diabetics and non-diabetics



Left arm was the most frequent site of pain radiation (46.6%), followed by interscapular radiation (33%). Radiations to left arm, interscapular region and lower jaw were less frequent in diabetics compared to non-diabetics (36.7% vs. 51.8% p=0.02, 22.2% vs. 39% p<0.001 and 11.1% vs. 29.3% p=0.001 respectively) (Table 2).

Regarding associated clinical features other that chest pain, vomiting and sweating occurred less frequently in diabetics compared to non-diabetics (40% vs. 51.2% p=0.041 and 15.6% vs. 44.5% p<0.001 respectively), while syncope and shortness of breath were more frequent in diabetics compared to non-diabetics (37.8% vs. 20.7% p=0.003 and 23.3% vs. 17.1% p=0.001 respectively) (Table 2).

Table 2: Distribution of chest discomfort patterns, pain radiation patterns, and associated features among diabetics and non-diabetics

	Total	Diabetics	Non-diabetics	p-value
N	254	90	164	-
Chest discomfort patterns				
Chest tightness	153 (60.2%)	41 (45.6%)	112 (68.3%)	<0.001
Pressure over precordium	105 (41.3%)	31 (34.4%)	74 (45.1%)	0.127
Strangulating pain	101 (39.7%)	8 (8.9%)	93 (56.7%)	<0.001

Squeezing chest pain	31 (12.2%)	1 (1.1%)	30 (18.3%)	<0.001
Burning sensation over precordium	12 (4.7%)	7 (7.8%)	5 (3%)	0.089
Pain radiation patterns				
Left arm radiation	118 (46.4%)	33 (36.7%)	85 (51.8%)	0.02
Radiation to interscapular region	84 (33%)	20 (22.2%)	64 (39%)	<0.001
Radiation to epigastrium	78 (30.7%)	31 (34.4%)	47 (28.7%)	0.495
Radiation to lower jaw	58 (22.8%)	10 (11.1%)	48 (29.3%)	0.001
Bilateral arm radiation	30 (11.8%)	6 (6.7%)	24 (14.6%)	0.06
Radiation to neck	14 (5.5%)	7 (7.8%)	7 (4.3%)	0.241
Associated features				
Episode of vomiting	120 (47.2%)	36 (40%)	84 (51.2%)	0.041
Profuse sweating	87 (34.3%)	14 (15.6%)	73 (44.5%)	<0.001
Syncope	68 (26.8%)	34 (37.8%)	34 (20.7%)	0.003
Shortness of breath	49 (19.3%)	21 (23.3%)	28 (17.1%)	0.001
Fits	25 (9.8%)	13 (1.9%)	12 (19.7%)	0.068
Feeling of indigestion	22 (8.7%)	8 (8.9%)	14 (8.5%)	0.924

DISCUSSION

The incidence of myocardial infarction (MI) is highest in South-Asia.[14]Around 90% of these cases have modifiable risk factors like diabetes, hypertension, smoking, etc.[2] Diabetic patients have a higher risk for MI and twice the short as well as long-term mortality after MI as compared to non-diabetic patients.[15-17] Chest pain is the commonest symptom experienced by patients but it can differ in nature and severity among diabetics and non-diabetics.[18] Atypical presentation and presentation without chest pain is also reported in diabetics.[9]

Gradiser et al reported a majority of diabetic patients presenting with severe chest pain, however, 51.7% of diabetics had a mild or no pain at all.[7] Canto et al also reported a large number of diabetic patients with lack of chest pain.[19] In our study, 22.2%of diabetic patients with acute STEMI had no chest pain at all and only 21.1% diabetics complained of severe chest pain, the majority of diabetics complained of moderate chest pain. These results are comparable to studies by Gradiser and Canto. Kennel et al and Rutter et al also showed the incidence of silent ischemia being more among diabetics as compared to non-diabetics.[3,20]

Diabetics may experience the pain of acute STEMI in the epigastric region more frequently compared to non-diabetics.[5]Similar observation was reported by Tbibiazeret al.[9] In our study, 34.4% of diabetic patients had epigastric discomfort, however, it was not statistically different from non-diabetics (34.4% vs. 28.7% p = 0.495). Zellweger et al reported 11% diabetic patients with shortness of breath as the symptom of CAD.[21] Our study showed that 23.3% diabetic patients complaint of shortness of breath which could be due to late presentation in diabetics leading to poor left ventricular function. In our study, shortness of breath and syncope were in fact more commonly associated with diabetics compared to the other group, thus emphasizing the importance of recognizing atypical symptoms in non-diabetics. The findings of this study may contribute to the understanding that diabetic patients may have less severe symptoms and atypical presentations emphasizing the need for more care and vigilance during their evaluation for possible STEMI.

Limitations

The major limitation of this study is being a single-center cross-sectional survey conducted with limited sample size. Additionally, duration and control of diabetes and their potential impacts on chest pain severity and patterns were not accounted for. Future research on the subject may be conducted with multicenter larger study populations incorporating potential impacts of missing factors from this study.

CONCLUSION

Diabetics can frequently present without pain or with less severe chest pain and infrequent typical characters compared to non-diabetics and may have atypical symptoms like syncope and shortness of breath more commonly than non-diabetics.

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