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ORIGINAL ARTICLE

Pattern of coronary artery disease in Non-ST-Elevation myocardial infarction patients in diabetic and non-diabetic patients.

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ABSTRACT… Objective: To compare the coronary artery disease pattern in patients with and without diabetes presenting with Non-ST-Elevation Myocardial Infarction (NSTEMI). **Study Design:** Retrospective, Hospital Based, Observational Comparative study. **Setting:** Punjab Institute of Cardiology, Lahore. **Period:** January 2022 to December 2022. **Material & Methods:** 180 Non-ST-Elevation Myocardial Infarction (NSTEMI) patients who were separated into two groups on the basis of Diabetes mellitus being absent or present and each group comprised of 90 individuals. All data was analyzed, and comparison was made among the two study groups. **Results:** Hypertension and smoking status was found to have significant differences among the two study groups. Significant number of individuals in the diabetic group were found to be smokers (46.6 % vs. 31.1 %; p = 0.03). The commonest risk factor in the diabetic group was noted to be hypertension. Single vessel disease was found to be significantly higher in the non-diabetic group in comparison with the diabetic group (25.5% vs 11.1%; p = 0.01) whereas diabetics showed significantly higher number of multivessel disease individuals. Coronary artery disease was more severe in the patients with Diabetes mellitus and grade was significantly higher along with LM being affected at a significantly greater rate in diabetic patients. **Conclusion:** Non-ST-Elevation Myocardial Infarction (NSTEMI) patients presented with Diabetes are more likely to have extensive and more severe coronary artery disease than the non-diabetic individuals.

Key words: Coronary Artery Disease, Diabetes Mellitus (DM), Lesion Severity, Non-ST-Elevation Myocardial Infarction (NSTEMI).

INTRODUCTION

Diabetes mellitus (DM) has taken form of a worldwide pandemic with its rapid expansion and affects more than 451 million individuals on a global scale.[1] It has been noted that risk of coronary heart disease (CAD) is increased many folds by DM and DM is also found in nearly 40% acute coronary syndrome (ACS) patients.[2,3] All the patients of type 2 DM show dyslipidemia and high cholesterol levels and all the diabetic patients are at 2 to 3 times higher risk of multivessel CAD compared to healthy otherwise non-diabetic people.[4]

ACS plays a significant role in causing cardiovascular mortality and morbidity and timely intervention is crucial for the improvement of clinical outcomes. Risk of myocardial infarction, recurrent ischemic events, and death is present in the ACS patient.[5] The last decade has seen an increase in proportion of the non-ST segment elevation myocardial infarction (NSTEMI) in the ACS patienst.[6,7] A tertiary cardiac center of the Pakistan demonstrated NSTEMI made up 47.6% of every case that is admitted for the ACS.[8] With intent of performing either delayed revascularization or early vascularization, it is recommended that coronary angiography be performed in NSTEMI.[9] Despite of the fact that medical management for the NSTEMI patients has seen improvements, poor prognosis is still related with this, particularly for the individuals in whom DM has been diagnosed previously.[10,11]

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Risk of death is elevated in the DM patients following acute cardiac events in comparison of individuals do not present with DM.[12-14] It has been demonstrated by the data that CAD is more diffused and severe in patients present with DM in comparison with the patients where DM is absent.[15]

A number of studies have been conducted to assess the prognosis and outcome of CAD in diabetic vs non-diabetic patients of acute coronary syndrome[11,16,17], only a few have focused on severity and pattern of CAD in NSTEMI specifically[18,19], Furthermore, even though it has been established that CAD is more severe and extensive in the individuals with NSTEMI[15,20,21], the effect that the status of Diabetes mellitus has on the angiographic profile of the individuals is not currently known so this study provide a piece of evidence about this effect. So this study was performed keeping in mind the aim of comparing severity and extent of the CAD in NSTEMI individuals on the basis of DM.

MATERIAL & METHODS

This study was based on a single center, retrospective, hospital based, observational comparative study, at Punjab Institute Of Cardiology from January 2022 to December 2022. Institutional review board approved the protocol of the study (RTPGME-Research-267). By the use of purposive sampling method, 180 individuals were made part of the study using non-probability convenient sampling technique on the basis of them getting admitted to the hospital with NSTEMI diagnosis and had undergone coronary angiography. Patients with chest pain troponin were positive, angiography was performed Exclusion criteria set for the individuals were on the basis of unavailability of the angiographic data and absence of consent for study. All the participants were required to provide an informed written consent. Renal Or Kidney Function Tests (KFT / RFT Tests) deranged were Excluded Two groups were made from the study subjects: group with diabetic individuals (Diabetic group) and group without diabetic individuals (non-diabetic group) where each group comprised of 90 individuals. All the relevant medical history, angiography findings, demographic data, and laboratory parameters were acquired on a form predesigned for collection of data.

NSTEMI was diagnosed according to the AHA/ACC guidelines presented in 2014 for NSTEMI patients management, as per that, when individuals are present with symptoms suggestive of myocardial ischemia when troponin I (quantitative_ results are increased and persistent ST segment elevation being absent in the ECG.[22]

DM was noted on a basis of patient being previously diagnosed of DM or via oral hypoglycemic drugs or via insulin during their admission or a new diagnosis of DM on the basis of criteria suggested by The American Diabetes Association.[23]

Criteria for diabetic patients to include in the study

- Fasting Plasma Glucose ≥126 mg/dL (inclusion criteria)
- 2-h Plasma Glucose ≥200 mg/dL during Oral Glucose Tolerance Test
- HbA1C ≥6.5%
- In an individual presenting classic hyperglycemia symptoms or hyperglycemic crisis, plasma glucose randomly being ≥200 mg/dL (11.1 mmol/L).

CAD noted in the coronary angiogram with >50% stenosis in any major epicardial coronary artery with diameter of the vessel being > 2mm was taken as obstructive CAD. Based on the involvement of the disease, classification of the obstructive CAD was done as (1) single vessel disease (SVD) –involved single coronary artery, (2) Double vessel disease (DVD) – involved two coronary arteries, and (3) Triple vessel disease (TVD) – involved three coronary arteries. Lesion of the coronary arteries with <50 % narrowing was considered insignificant stenosis.

Following the methodology of Hegde, et al.[24] grading of lesion severity as observed in the angiography is as follows:
Grade 0: No disease
Grade 1: Intimal disease <50% stenosis

Grade 2: 50-69% stenosis
Grade 3: 70-95% stenosis
Grade 4: 96-99% stenosis
Grade 5: Total occlusion

Definitions for Measuring the Clinical Management and Outcomes of Patients with Acute Coronary Syndrome as well as American College of Cardiology Key Data Elements were used for defining other risk factors along with clinical history.[25] Summarization of the qualitative variables was done as absolute percentages and frequencies. Expression of quantitative data was done as means ± standard deviation. Comparison of the qualitative variables and quantitative variable of the groups was done using chi-squared test and Student's t-test, respectively. P value being less than 0.05 was taken as statistically significant. Statistical Package for Social Sciences version 26 (SPSS V.26) was used to perform statistical analysis.

RESULTS

Table-I depicts baseline characteristics of test subjects of the study. Among the 90 individuals included in both groups, no significant difference was found regarding the demographic characteristics. Contrary to that, high prevalence of dyslipidemia, smoking, hypertension, and previous myocardial infarction was found in the diabetics.

Variables	Diabetic (n=90)	Non-diabetic (n=90)	P-Value
Age (year), mean ± SD Gender, n (%)	60.19±5.12	59.08 ± 5.35	0.15
Male	50 (55.5%)	52 (57.7%)	0.76
Female	40 (44.4%)	38 (42.2%)	
BMI, mean ± SD	24.24 ± 2.87	23.65 ± 2.96	0.17
Risk Factors			
Hypertension	45 (50%)	28 (31.1%)	0.01*
Smoking	42 (46.6%)	28 (31.1%)	0.03*
Dyslipidemia	43 (47.7%)	33 (36.%)	0.13
Previous MI	18 (20 %)	11 (12.2%)	0.15
Creatinine (mg/dl)	0.91 ± 0.15	0.94 ± 0.14	0.20
HbA1C (%)	7.70 ± 0.63	5.42 ± 0.85	< 0.001*

Table-I. Baseline data of the patients of both the groups
***Statistically significant**

Table-II and III show the angiographic characteristics of the two study groups. 6 (6.6 %) of the patients of diabetic group and 12 (13.3 %) patients of non-diabetic group were observed with insignificant stenosis (i.e., < 50% stenosis). Single vessel disease was found in higher prevalence in non-diabetic patients in comparison to the patients with diabetes (p = 0.01) whereas diabetics were found with higher prevalence of triple vessel disease (p = 0.04). General results indicated higher prevalence of multivessel disease in the patients with diabetes in comparison with the non-diabetic patients (81 % vs 58.9 %, p = 0.02).

Variables	Diabetic (n = 90)	Non- diabetic (n = 90)	P-Value
No. of vessels ≥ 50% stenosis			0.02*
No vessel	1 (1.1%)	2 (2.2%)	0.56
Single vessel	10 (11.1%)	23 (25.5%)	0.01*
Double vessel	35 (38.8%)	28 (31.1%)	0.28
Triple vessel	38 (42.2%)	25 (27.7%)	0.04*

*Statistically significant

Table-II. Number of vessels involved in both the study groups

In 53% of the diabetic the stenosis severity ranged from grade 4 to grade 5 in comparison with the 15.5% patients of the non-diabetic group (Table-III). Prevalence of grade 5 stenosis or total occlusion was found to be greater in diabetic patients in comparison with the non-diabetic patients (p < 0.001).

Variables	Diabetic (n=90)	Non-diabetic (n=90)	P-Value
Lesion Severity			< 0.001*
Grade 0/1	14 (15.5 %)	33 (36.6 %)	0.001*
Grade 2	13 (14.4 %)	30 (33.3 %)	0.003*
Grade 3	15 (16.6 %)	13 (14.4 %)	0.68
Grade 4	29 (32.2 %)	10 (11.1 %)	< 0.001*
Grade 5	19 (21.1 %)	4 (4.4 %)	< 0.001*

Table-III. Severity of CAD observed in both the groups
***Statistically significant**

Significant difference was observed between the diabetic and non-diabetic group with regard to involved vessel (p = 0.028). Moreover, significant difference was noted regarding the LMCA involvement in the diabetic patients (10%) in comparison with the non-diabetic patients (1.1%). LAD was the most common vessel found

involved in the diabetic patients with being involved in 77.7% in the case of diabetic patients and 66.6% in the case of non-diabetic patient, however, no significant difference was observed for any coronary artery involved expect LMCA

DISCUSSION

This study was observational comparative study in nature consisting of 180 patients present with ACS and had undergone coronary angiography so that their detailed findings of coronary angiography can be compared among the diabetic and non-diabetic individuals.

Hypertension as well as diabetes mellites serve as risk factors for the atherosclerosis along with the related comorbidities such as heart attacks and strokes. Both hypertension and diabetes truly overlap as such reflecting mechanism of disease and etiology. In Hong Kong Cardiovascular Risk Factor Prevalence Study, it was noted that only 42 diabetics out of every 100 individuals included in the study were normotensive and 56 out of every 100 individuals with reported hypertension were nondiabetic.[26] One other study was performed in the United States which noted hypertensive patients to be at nearly 2.5 times greater risk of developing type 2 diabetes mellitus compared to individuals with no hypertension.[27] Factually, it cannot be credited to chance that diabetes and hypertension are found more often collectively in a single patient.[28] This finding is in concordance to our study where we found hypertension to be in significantly greater prevalence in the diabetic patients as compared to the non-diabetic patients. As far as risk factors are concerned, our study found no significant differences regarding previous MI, sex, age, and BMI among both study groups. Although diabetic group had increased number of patients present with dyslipidemia, yet still this was not a statistically significant difference among the two study groups and this finding was in accordance with the findings of the study conducted by Timalsena, et al.[19] Nevertheless, diabetic patients present with NSTEMI very noted to have significantly higher rate of smoking. Opposed to our findings, it was shown in a study by Mahadeva, et al.[29] that non-diabetic NSTEMI patients have a higher rate of smoking. The finding that smoking is more prevalent among diabetics highlights the impact of smoking on severity of CAD additionally to diabetes. Our finding suggests CAD to be more severe in the NSTEMI diabetic patients than the NSTEMI non-diabetic patients. Not only did we note greater number of vessels being involved in NSTEMI individuals with DM but the severity of vessels involved was also greater in such patients as shown by greater number of 4-5 grade patients. Sousa, et al.[18] performed a study and noted NSTEMI ACS patients with DM to have major atherosclerotic changes in their coronaries regarding luminal obstruction along with extent of vessel getting affected. Another study was performed in a Nepalese tertiary care cardiac center which showed higher prevalence of triple vessel disease in ACS patients with DM compared to ACS patients with no DM.[30] Similar to that, a study was conducted in India which noted NSTEMI patients with diabetes to be more likely to have double vessel and triple vessel disease.[31] Our findings are in accordance with the mentioned studies i.e., prevalence of multivessel disease is significantly increased in the NSTEMI diabetic patients compared to NSTEMI patients with no DM.

Atherosclerosis is accelerated in the presence of diabetes.[32] Other than this mechanism, major involvement of the coronary artery in the patients of diabetes might also be because of myocardial ischemia being present without symptoms in the diabetics. Thus, when they develop ACS, their disease is in an advanced stage with multivessel coronary atherosclerosis being in higher incidence at the diagnosis.

A previously conducted study of large scale which reviewed angiography registry of 18137 individuals present with stable angina or ACS with the aim of investigating prevalence of any significant stenosis of the LMCA in the stable angina or ACS patients and assessing the influence of the clinical profiles as well as demographics on the findings. They noted DM to be an independent LMCA stenosis risk factor.[33] Similarly, in our study, involvement of LM coronary artery was found to be more prevalent significantly in the DM patients compared to non-

DM patients. Moreover, in a recently conducted study based on 322 ACS patients undergoing optical coherence tomography imaging of culprit lesion pre-intervention, no significant differences were noted regarding prevalence of each of the affected coronary artery i.e., RCA, LAD, LCX among the two study groups.[34] Our findings were similar.

Studies conducted in the past have noted DM to be associated with poor prognosis in NSTEMI patients.[11,35] This may be linked with increased severity of CAD in the patients with DM as noted in the current study.

The current study was faced with numerous limitations. The study was based on a single center. Analyzation of the diabetes duration on the involvement of coronary artery was not done. For the confirmation of results noted in the current study as well as to overcome the limitations, it is crucial that multicenter study including a large sample size be performed in the future.

CONCLUSION

NSTEMI patients presented with DM are more likely to have extensive and more severe coronary artery disease than the non-diabetic individuals. Thus, aggressive changes to the lifestyle for the modification of the risk factors, medications and routine check-up may help in lowering the morbidity as well as mortality of the cardiovascular disease both after and before ACS in DM patients.

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2	Suleman Khan	Data collection.	
3	Zohaib Sadiq	Data collection.	
4	Amir Jameel	Framwork of study.	
5	Rizwan Bilal	Discussion, Write up.	
6	Omer Aslam	Article review.	