Original Article

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Coronary Artery Involvement in Diabetic and Non-diabetic Patients with Acute Coronary Syndrome

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Abstract

Introduction: Coronary artery disease (CAD) accounts for the major chunk of mortality in diabetes. Coronary angiography or arteriography remains the "gold-standard" technique for diagnosing and evaluating CAD.

Materials and Methods: 1000 patients with acute coronary syndrome (ACS), 500 patients who are diabetic, and 500 who are non-diabetic admitted in SSIMS hospital, selected randomly during a period of 1-year. Random blood sugar, fasting blood sugar, and glycosylated hemoglobin (HbA1c) were done in all patients with ACS and were taken up for coronary angiography.

Results: Peak incidence of ACS in diabetes was in third and fourth decades as compared to the fifth and sixth decades in non-diabetics. 240 (48%) out of 500 diabetics with ACS and Type 2 diabetes mellitus for 5-10 years. 223 (44%) out of 500 diabetic patients had triple or multivessel disease (MVD) compared to 82 (16%) out of 500 non-diabetics. Out of 1000 patients of both diabetics and non-diabetics with ACS, a total number of vessels involved were 1994, out of which 61.3% are involved in diabetics and 38.6% in non-diabetics. About 233 (46%) out of 50 diabetic patients required coronary artery bypass grafting (CABG) as treatment outcome. Higher the HbA1c levels of >8.5%, 69.2% had triple/MVD and 191 (73.1%) out of 235 patients who had to undergo CABG had HbA1c levels >8.5%.

Conclusion: ACS in diabetic patients presented earlier in life, the severity and extent of CAD and incidence of MVD was significantly high in diabetics when compared to non-diabetics with ACS. Diabetics with poor control having high levels of HbA1c, more number of coronary vessel involvement, the mode of treatment required in them was CABG.

Key words: Acute coronary syndrome, Coronary angiogram, Diabetes mellitus

INTRODUCTION

Coronary artery disease (CAD) accounts for the major chunk of mortality in diabetes. CAD alone accounts for 40% of deaths in diabetics during the fourth decade of life, and this amounts to 50-70% of deaths above the age of 65 years.[1] Valuable parameters such as patients history, thorough physical examination, non-invasive techniques such as resting electrocardiograph (ECG), Holter monitoring, stress echocardiography, stress thallium imaging, and stress test are few important in establishing the diagnosis of myocardial ischemia in diabetes but to get the definitive diagnosis of CAD (coronary artery disease) requires invasive diagnostic modality like coronary angiography.

Coronary angiography is considered and remains the "gold-standard" technique for diagnosing and evaluating CAD.[2]

Hence, the present study was undertaken in an attempt to find, how acute coronary syndrome (ACS) in diabetics differs from that of non-diabetics, with special emphasis is given on patient's angiographic profile.

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Objective

The objectives were to study angiographic extents, type of vessels, number of vessels, severity, composition of lesion, and any complicated lesion involving coronary artery and its branches in patients with ACS and to compare the same in diabetic and non-diabetic patients with ACS.

MATERIALS AND METHODS

The present study is a cross-sectional study. This study was conducted on 1000 patients with ACS among which 50 patients who are diabetics and other 50 patients who are non-diabetics admitted in S.S. Institute of Medical Sciences, Davangere, Karnataka, India. Patients who matched the inclusion and exclusion criteria were selected randomly during approximately 1½ years formed the study group. Patients were divided into two groups. Group 1 (diabetic) were previously known diabetic or first time detected diabetic by American Diabetes Association (ADA) criteria presenting with ACS and Group 2 (non-diabetic) consisted of cases presenting with ACS who is non-diabetic or not fulfilling ADA criteria. Patients having impaired fasting plasma glucose (FPG ≤126 mg/dl but ≥110 mg/dl, PPPG 140-200 mg/dl) presenting with ACS were excluded from the study.

Investigations such as complete hemogram, fasting blood glucose levels by collection method, random blood glucose levels, blood urea, serum creatinine, lipid profile, cardiac enzymes; creatine phosphokinase-M, ECG, 2D ECHO, Treadmill test, coronary angiogram, and glycosylated hemoglobin (HbA1c) in diabetic and newly detected diabetes mellitus (DM) was done.

Those patients who complaints about acute chest pain or breathlessness were diagnosed to check ACS based on ECG and cardiac enzymes. Random blood sugar and along with that fasting blood sugar were done for all the patients. Patients with ACS having diabetics and non-diabetics were treated. Once patients were stabilized was taken up for coronary angiography which was performed by the standard Judkins technique after adequate preparation.

Indication for performing coronary angiography was unstable angina, non-ST-segment elevation myocardial infarction (STEMI) and STEMI, and post-infarct angina.

Severity of lesions was graded 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.

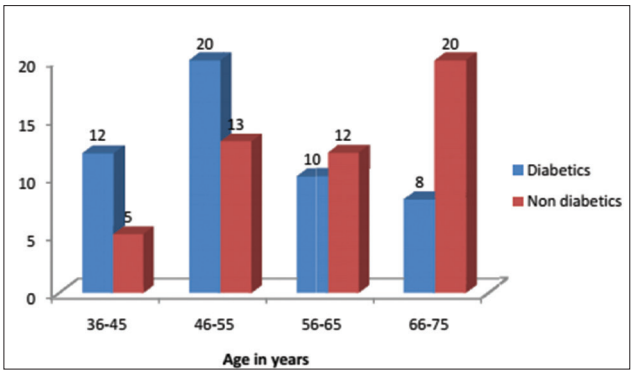
Coronary artery whose narrowing was graded more than or equal to 70% was considered as significant stenosis. HbA1c was done in all the diabetics' patients and in newly detected Type 2 DM patients. Classification of the diabetic patients was done with their HbA1c control scores as <7 is good control, 7-8.5 is fair control, and >8.5 poor control. Depending on these findings, a further treatment plan was planned that whether the patient requires medical line of management, percutaneous transluminal coronary angioplasty (PTCA), or coronary artery bypass grafting (CABG).

Statistical Analysis

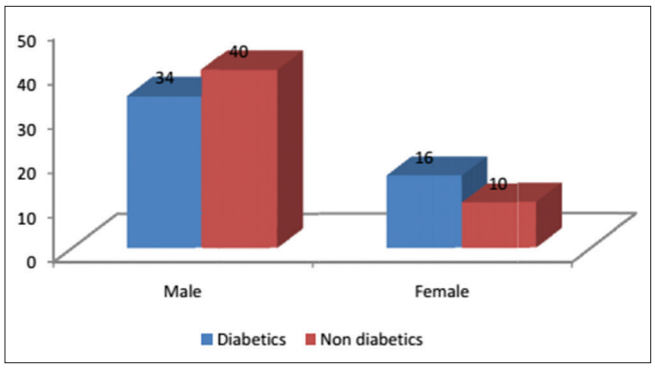
Data collected was represented as number and percentages in tabular form. Chi-square test was used to determine any significant difference between two groups. $P < 0.05$ was considered for statistical significance.

RESULTS

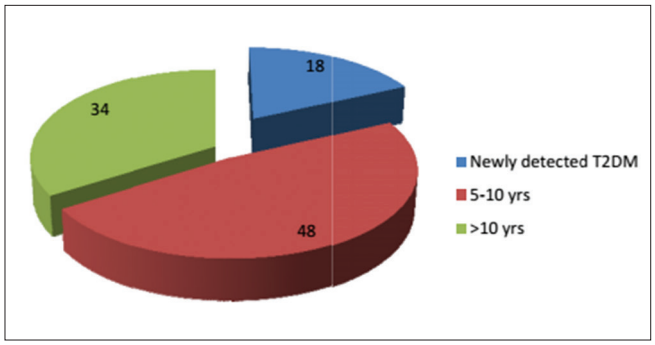
The peak incidence of ACS in diabetics was in the fourth and fifth decades as compared to the fifth and sixth decades in non-diabetics. In our study, we found that the risk of developing of ACS in females was more in diabetics compared to non-diabetics. 18% of the patients were newly detected and diagnosed as diabetic and 34% had a longer duration of diabetes of >10 years. Left ventricular dysfunction was relatively more common (46%) in diabetics than in non-diabetics (10%). The incidence of triple vessel disease in diabetics was much higher (44%) compared to non-diabetics (16%). The incidence of double vessel disease was slightly higher (26%) compared to non-diabetics (20%). Out of 1000 patients of both diabetics and non-diabetics with ACS, total number of vessels involved are 1990, out of which 61.3% are involved in diabetics were as 38.6% in non-diabetics which is significant suggesting patients with diabetics have more number of the vessel involved. A statistically significant difference in the involvement of left main coronary artery (LMCA) in diabetics (7.5%) compared to non-diabetics (1%). Furthermore, total occlusion was significantly high in diabetics (20%) as compared to 6% in non-diabetics. The incidence of triple vessel disease was significantly higher in patients with duration of diabetes more than 10 years (94%). 46% of diabetic patients required CABG as treatment option compared to 16% of non-diabetics. In patients with HbA1c of <7 (good control), 85.7% had single vessel involvement and no triple vessel disease. Whereas patients with HbA1c >8.5 (poor control) had 69.2% of triple/multivessel disease (MVD) and 7.7% of single vessel involvement. In our study, patients with poor control of HbA1c >8.5, 73.1% of them had to undergo CABG whereas with good control of HbA1c <7, 85.7% of them underwent PTCA (Graphs 1-7).



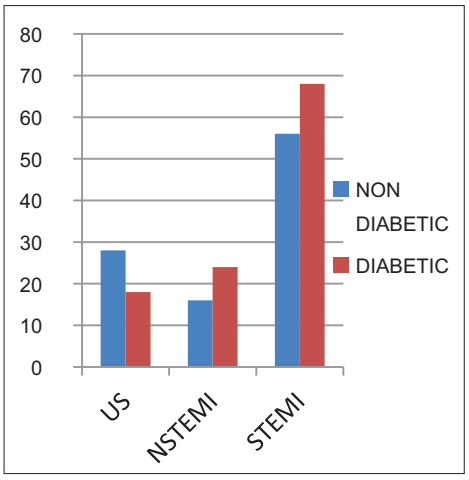
Graph 1: Age distribution



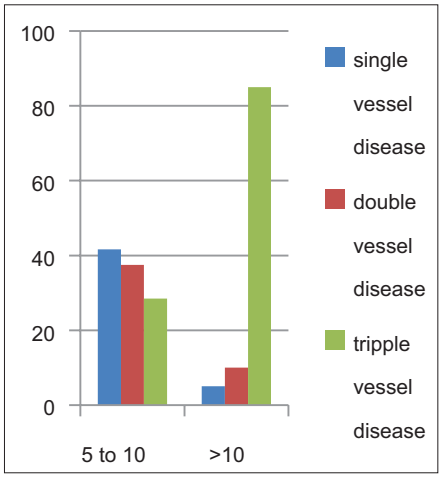
Graph 2: Sex incidence



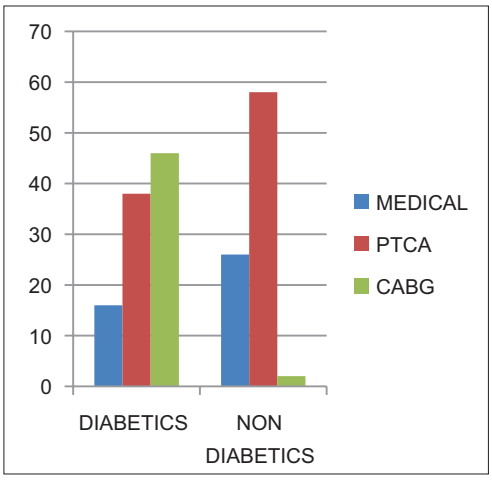
Graph 3: Duration of diabetes



Graph 4: Type of acute coronary syndrome



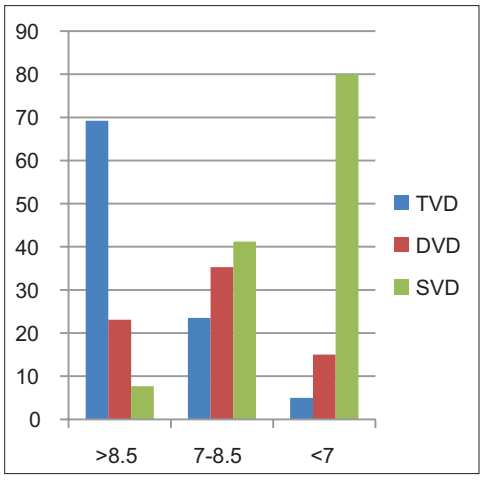
Graph 5: Number of vessels involved



Graph 6: Treatment option

DISCUSSION

The incidence of triple/MVD was significantly higher with the duration of diabetes >10 years (94.1%). These findings correlate with the other study by Fox *et al.*,[3] showing the risk of coronary heart disease was 1.38 times higher for each 10 years increase in the duration of diabetes (95% confidence interval, 0.99-1.92). In our study, diabetic patients with higher HbA1c levels, 73.1% of them had CABG as treatment outcome. Suggesting prevalence of elevated HbA1c levels in patients undergoing coronary artery bypass surgery. These findings correlate with other study conducted by Engoren *et al.*[4] In our study, coronary angiography revealed that the incidence of MVD in diabetics was much higher (50%) compared to non-diabetics which were only 16%. This finding correlates with the other study by Calton *et al.*,[5] showed a higher incidence of MVD in diabetics (57.3%) compared to 41.3%



Graph 7: Significance of glycosylated hemoglobin control with vessels involved

in non-diabetics. In another study conducted at CMC Vellore (1996) also showed that MVD was more common in diabetics (87.5% vs. 79.6%) in 2 separate groups of 516 diabetic and non-diabetic patients. In a study by Henry *et al.*,[6] and Sousa *et al.*,[7] there was increased the incidence of triple vessel disease, and more diffuse lesions were noted. In our study, the number of patients having total occlusion was 20% in diabetics and 6% in non-diabetics. This finding is statistically significant ($P < 0.01$). Hence, the extent and severity of CAD were significantly high in diabetic patients with ACS when compared to non-diabetic with ACS. This finding was similar in other studies such as Mossavi *et al.*,[8] Uddin *et al.*,[9] Nicholls *et al.*,[10] and Rana *et al.*,[11] where they found the angiographic extent and severity of CAD was high in diabetic patients with ACS.

CONCLUSION

ACS in diabetic patients presented much earlier in life than non-diabetic patients. The severity and extent of CAD in diabetics was more compared to non-diabetics. Involvement of LMCA was significantly high in diabetics. The severity of stenosis and total occlusion of vessels were more commonly seen in diabetic patients. The incidence of the triple vessel or MVD was significantly higher with the duration of diabetes more than 10 years. The majority of the diabetic patients with ACS require CABG as the main mode of treatment. In diabetic patients, the incidence of triple or MVD and requiring CABG as the mode of treatment was with poor glycemic control.

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