

COMPARATIVE STUDY OF CORONARY ANGIOGRAPHIC FINDINGS BETWEEN DIABETIC AND NON DIABETIC PATIENTS

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Article Info: Received 30 April 2019; Accepted 30 May, 2019

DOI: <https://doi.org/10.32553/ijmbs.v3i5.267>

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Conflict of interest: No conflict of interest.

Abstract:

Background: Coronary artery disease (CAD) is one of the most important manifestation of diabetes mellitus. **Objectives:** To assess the extent of CAD in diabetic and non diabetic patients undergoing coronary angiography. **Materials and Methods:** 793 patients with suspected CAD, 202 diabetics and 591 non-diabetics were enrolled in the study. All patients underwent coronary angiography. **Results:** Normal coronaries were more common in non diabetic patients. Age at first presentation in diabetics was earlier as compared to non-diabetics. Diabetic female patients presented as early as third decade of life. Single vessel involvement was significantly more in non diabetics [40.27%] as compared to diabetic patients [19.8%] [P= <0.001], while there were statistically no significant differences in double vessel disease in both groups [P= 0.572]. Triple vessel disease were more common in diabetic than non diabetic patients [P= <0.001]. Left main disease, left circumflex coronary artery disease, coronary calcification, diffuse disease and CTOs were more common in diabetic patients. **Conclusion:** The severity and extent of CAD and incidence of triple vessel disease was significantly high in diabetics when compared to non diabetics.

Key Words: Coronary angiography; Coronary artery disease; Diabetes mellitus.

Introduction

Coronary artery disease (CAD) due to atherosclerosis is a major cause of death all over the world and is the most common form of heart disease [1, 2]. Diabetes mellitus (DM) is a major risk factor for the development of CAD and adversely affects overall clinical outcomes [3]. Correlation between DM and CAD was established at 1870 after the work of Seegen J Der, who emphasized the higher incidence and mortality of CAD among diabetics [4]. Cardiac affliction is by far the commonest cause of mortality in patients with diabetes [5]. Cardiac involvement in diabetes commonly manifest as CAD and less commonly as diabetic cardiomyopathy and cardiac autonomic neuropathy [6]. Diabetic patients have several hematologic and metabolic abnormalities; not present in their non diabetic counterparts [7, 8, 9]

that may predispose them to formation of more complex plaque. Strict control of blood sugar improves micro vascular complications, but has little effect on CAD events (10). DM ranked the second commonest cause of worldwide non communicable diseases (NCDs) mortality next to CVDs [4].

Aims and Objectives: To study angiographic extent, type of vessels, number of vessels, and severity involving coronary artery in patients with diabetes and without diabetes.

Inclusion criteria: All patients clinically diagnosed or documented to have CAD, who required coronary angiography (CAG) was taken as study population. Informed consent was taken from all patients.

Exclusion Criteria: Patient with valvular heart disease, congenital heart disease and patients having

impaired fasting glucose level presenting with CAD. (FPG 100-125 mg/dl, PP-PG 140- 200mg/dl).

MATERIAL AND METHODS

The present study was undertaken at RNT Medical College and Hospital, Udaipur, Raj. India during the periods of 1st march 2017 to 31st January 2019. CAG was performed in 793 consecutive patients with history suggestive of ischemic chest pain. All patients were known to have CAD confirmed by typical history of disease, electrocardiography (ECG), positive exercise ECG test and cardiac enzymes for majority of the patients. Two dimensional Echocardiography was done for all patients to assess left ventricular function. All Patients with DM were already on oral anti diabetic drugs or insulin. The diagnosis of DM was established when the fasting plasma glucose levels were higher than 126 mg/dl or the patient reported receiving hypoglycemic treatment [11]. The non diabetics were considered as a control group, if there fasting plasma sugar (FPS) was less than 7 mmol/L [126 mg/dl]. Coronary angiography was performed by radial/femoral route. CAD was defined

as ≥50% diameter stenosis of left main coronary artery lumen or ≥70% diameter stenosis of other coronary vessel lumen. Multivessel disease was defined as the involvement of any three or more of the following four arteries: the left main artery, the left descending artery (LAD), the left circumflex artery (LCX) and the right coronary artery (RCA). Diffuse lesion was defined as a stenosis of more than 20 mm in length.

Statistical Analysis: Continuous variables were expressed as mean, standard deviation (SD), and qualitative data were presented as percentages and frequencies. Chi-square test was used to determine any significant difference between two groups. p value of less than 0.05 was considered significant. The statistical analyses were performed with SPSS software (version 16.0)

RESULTS

Our study group consist of 793 patients, out of them 202 [25.5%] were diabetic and 591[74.5%] were non diabetic.

Table 1: Distribution of DM and Non DM patients under study.

Observation	Diabetic		Non diabetic		P value
Normal CAG	[7]	3.465%	[45]	7.6%	
Abnormal CAG	[195]	96.53%	[546]	92.4%	
Total	[202]	25.5%	[591]	74.5%	0.04

Normal coronaries were more common in non diabetic as compared to diabetic [P= 0.04] [table 1, fig 1].

Table 2: Age wise distribution of diabetic and non diabetic groups .

years	Diabetic			Non Diabetic		
	Male	Female	Total	Male	Female	Total
21-30	3(2.31%)	4(6.15%)	7(3.6%)	2(.463%)	0(0%)	2(.366%)
31-40	7(5.38%)	7(10.77%)	14(7.18%)	40(9.26%)	4(3.51%)	44(8.1%)
41-50	35(26.9%)	12(18.5%)	47(24.1%)	70(16.2%)	20(17.54%)	90(16.5%)
51-60	45(34.6%)	16(24.6%)	61(31.3%)	122(28.2%)	30(26.3%)	152(27.84%)
61-70	22(16.9%)	20(30.77%)	42(21.54%)	110(25.46%)	48(42.1%)	158(28.94%)
71-80	12(9.23%)	4(6.15%)	16(8.2%)	68(15.74%)	10(8.77%)	78(14.3%)
81-90	6(4.6%)	2(3.08%)	8(4.1%)	20(4.63%)	2(1.75%)	22(4.03%)
Total	130(100%)	65(100%)	195(100%)	432(100%)	114(100%)	546(100%)

Age at first presentation in diabetics was earlier as compared to non-diabetics. Diabetic female patients presented as early as third decade of life. Effect of diabetes on incidence of CAD in premenopausal years is more marked in diabetics (17%) compared to non diabetics (3.51%) [p=0.0018] [table 2]. Almost 50% of patients in

both groups were at the age between 50 to 70 years, hence, age is an independent common risk factor for CAD in both diabetic and non diabetic patients.

Table 3: Sex wise distribution of patients in diabetic and non diabetic groups

Sex	Diabetic	Non DM	Total	P value
Male	130(66.7%)	432(79.1%)	562(75.8%)	
Female	65(33.3%)	114(20.9%)	179(24.2%)	
Total	195(100%)	546(100%)	741(100%)	
M : F	2:1	3.8:1		<0.001

Gender	Diabetic Patients Age in years	Non Diabetic Patients Age in years	P Value
Male (Mean±Sd)	55.96±12.87	58.97±13.26	0.0227
Female (Mean±Sd)	54.88±14.57	59.54±10.47	0.0143

The male female ratio in diabetics was 2:1 whereas in non diabetics, it was 3.8:1 [p=0.001]. So the risk of developing CAD in females was more in diabetics compared to non-diabetics. The mean age of diabetic male patients (55.96 ±12.87years) and diabetic female patients (54.88 ±14.57 years) were significantly [(P =0.0227) and (p =0.0143)] lower than non-diabetics male (58.97± 13.26 years) and non diabetic female (59.54±10.47 years) patients respectively [Table -3].

Table 4: Extent of coronary artery disease among diabetic and non diabetic groups.

Extent of CAD	Diabetic	Non Diabetic	Total	P-value
Normal CAG	7 [3.465%]	45 [7.6%]	52 [6.56%]	0.04
SVD	40 [19.8%]	238 [40.27%]	27 [35.05%]	<0.001
DVD	70[34.65%]	192 [32.5%]	262 [33%]	0.572
TVD	85 [42.1%]	116 [19.6%]	201 [25.35%]	<0.001
Total	202 [100%]	591 [100%]	793 [100%]	

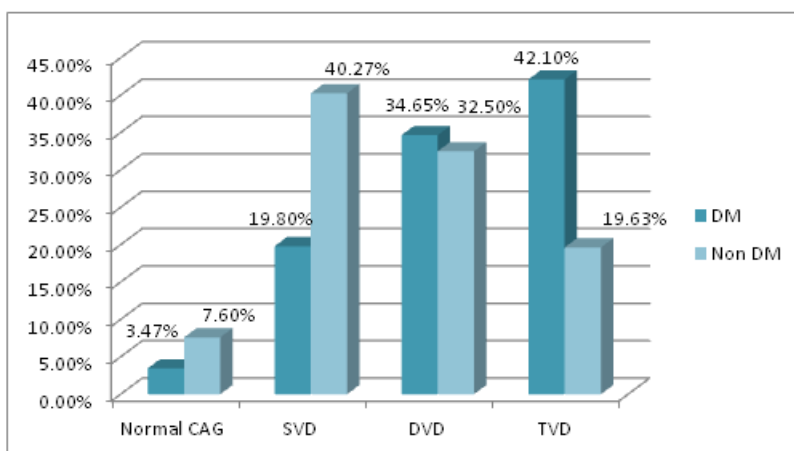


Figure 1: showing pattern of vessel involvement in diabetic and non diabetics.

Single vessel disease (SVD) was significantly more [n=238, (40.27%)] in non diabetics as compared to diabetic patients [n=40, (19.8%)] [P= <0.001]. In the diabetic group 70 [34.65%] and in non diabetic group 192 patients

[32.5%] had double vessel disease (DVD), without statistically significant differences between them [P= 0.572][fig 1].

Table 5: Distribution of SVD among diabetic and non diabetic patient.

Coronary artery	Diabetic	Non Diabetic	p value
LAD	25 (62.5%)	146 (61.3%)	0.889
LCX	11 (27.5%)	32 (13.44%)	0.023
RCA	4 (10%)	60 (25%)	0.034
Total	40	238	

In SVD group more diabetic patients than non diabetic patients had LCX disease [p= 0.023], whereas, more non diabetic patients had RCA disease [p=0.034].

Table 6: Distribution of DVD among diabetic and non diabetic patient.

DVD	Diabetic No %	Non Diabetic No %	[p value]
LAD and LCX	43 [61.4%]	72 [37.5%]	0.001
LAD and RCA	12 [17.14%]	78 [40.6%]	<0.001
RCA and LCX	15 [21.4%]	42 [21.87%]	0.938
Total	70 [100%]	192 [100%]	

In DVD group, more diabetic patients had LAD and LCX disease [p=0.001] whereas, more non diabetic patients had LAD and RCA disease [p=<0.001][Table -6]. Differences in RCA and LCX involvements between two groups were statistically not significant [p=0.938].

Three vessels disease (TVD) were more common in diabetic than non diabetic patients [P= <0.001]. In our study, CAG revealed that the incidence of multivessel disease in diabetics was much higher (42.1%) compared to non-diabetics (19.6%) [Table 4].

Table 7: High risk angiographic findings in Diabetics and Non Diabetics

Association	Diabetic %	Non Diabetic %	[p value]
L.M disease	22 [11.34%]	31 [5.68%]	0.009
Calcification	43 [22.2%]	69 [12.64%]	0.002
Diffuse disease	78 [40.2%]	73 [13.4%]	0.001
CTOs	25 [12.89%]	23 [4.2%]	<0.001
Total	195	546	

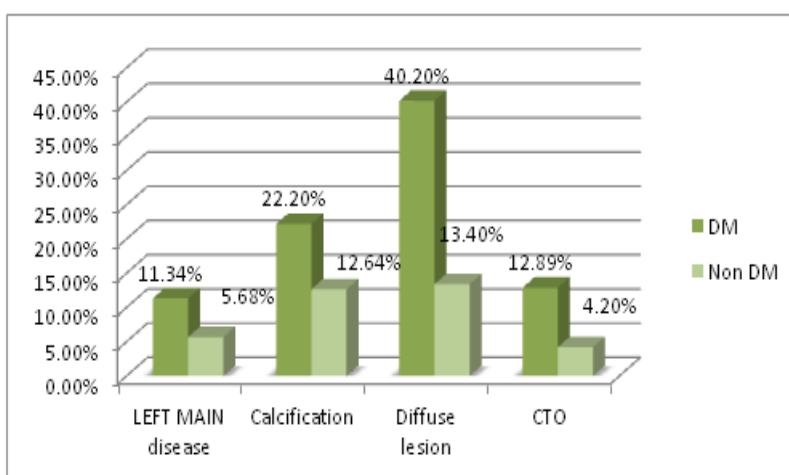


Figure 2: showing high risk PCI finding in coronary angiography among DM and non DM group.

Significant difference present in the involvement of LMCA in diabetics (11.34%) compared to non diabetics (5.68%) [P = 0.009]. In our study, the number of patients having total occlusion was 12.89% in diabetics and 4.2% in non diabetics. ($p < 0.001$). The diffuse critical lesions were significantly higher in diabetics (40.2%) than non-diabetics (13.4%) patients [$p < 0.001$][Table -7]. Coronary artery calcification was seen in 22.2% diabetic patients compared to 12.64% of non diabetic patients [$p = 0.002$]. Hence the extent and severity of coronary artery disease was significantly high in diabetic patients.

DISCUSSION

DM is one of the modifiable risk factor for CAD. Insulin resistance leads to hyperinsulinemia, which in turn causes elevated triglyceride levels, low levels of high density lipoprotein cholesterol, enhanced secretion of very low density lipoprotein, disorders of coagulation, increased vascular resistance and hypertension [12]. Normal coronaries were more in non diabetics than diabetic patients, and this result was consistent with other studies [13, 14]. The risk of developing CAD in females was more in diabetics compared to non diabetics as shown by Garcia MJ et al [15], we also had almost similar results. In the GUSTO-1 trial, diabetic patients were older compared to non-diabetic. But such results were not seen in our study. GUSTO-1 trial concluded that females were commonly involved in diabetic group, which was consistent with our results ($P < 0.001$) [16]. This increased risk is greater in women, since they lose their protection against CAD associated with the menstrual hormonal cycle. In our study LAD was the most commonly involved vessel in both the groups. These results are inconsistent with so many other studies where LAD and LCX were the most commonly involved artery in Non DM and DM patient respectively (17, 18, 19, 20, 21). In our study TVD was more common in diabetic group, a finding correlates with the study by Singh RB et al [22]. Diabetic patients more frequently had a pattern of diffuse disease in our study, this finding is consistent with so many other studies [23, 24, 25].

Study limitations: a) non randomized study,

b) study done in a single hospital,

c) no co-relation between duration of DM and pattern of vessel involvement studied.

Acknowledgment: The authors wish to acknowledge the statistical analysis of the data by Dr Pratap Bhan Kaushik Lecturer statistics, department of PSM, RNT Medical College, Udaipur, Rajasthan.

Conflicts of interest: The authors declare that there is no conflict of interests regarding the publication of this paper.

CONCLUSION

This study showed that CAD in diabetic patients presented much earlier in life especially in females. The severity and extent of CAD in diabetic patients were more compared to non-diabetics. More diabetic patients than non diabetic had left main and left circumflex coronary artery disease. Calcified lesions and total occlusion of vessels were more commonly seen in diabetic patients. With increasing age, incidence of triple vessel and diffuse disease was significantly higher in diabetic patients. These high risk findings in diabetic patients makes them prone for suboptimal results after percutaneous transluminal coronary angioplasty (PTCA). Even after successful PTCA, de novo appearance of such lesions in native vessels makes patients susceptible to repeat interventions.

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