Comparison of Angiographic Profiling of Acute Coronary Syndrome between Diabetic and Non Diabetic in South Indian Population

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ABSTRACT

Introduction: Diabetes mellitus (DM), one of the most important risk factors for the development of coronary artery disease (CAD), is recently considered as a CAD risk equivalent[4]. Definitive diagnosis, precise assessment and anatomic severity of CAD requires invasive diagnostic modality like coronary angiography. Aims and objectives: Comparison of angiographic profiling of Diabetic and Non-Diabetic patient in a South Indian population.

Materials and methods: 102 patients with ACS, 51 diabetics and 51 nondiabetics admitted in Coimbatore Medical College Hospital, Coimbatore were selected randomly during a period of approximately one years which formed the study group. RBS, FBS was done in all 102 patients. All subjects with ACS were taken up for coronary angiography. Statistical Analysis: Chi-square test was used to determine any significant difference between two groups. p-value of less than 0.05 was considered significant.

Results: In our study, the risk of developing ACS in females was more in diabetics compared to non-diabetics; 26 (51%) out of 51 diabetic patients had multi-vessel disease compared to 12 (23%) out of 51 non diabetics. Severity of stenosis ranging from grade 4-5 was noticed in 72.55% of the diabetics compared to 47.05% in non-diabetics. Total occlusion or grade 5 stenosis was significantly high in diabetics as compared to non-diabetics.

Conclusion: This study showed that the severity and extent of CAD and incidence of triple/multi vessel disease was significantly high in diabetics when compared to non-diabetics with ACS.

Keyword: Acute Coronary Syndrome, Diabetic, Angiography.

INTRODUCTION

The prevalence of coronary artery disease (CAD) has progressively increased in India during the latter half of the last century with an estimated adult prevalence of around 10% in urban settings and 3–4% in rural areas[1]. Diabetes who has been considered as a 'CAD equivalent' finds the maximum prevalence in India which has been unfortunately but truly termed as the 'diabetic capital of the world'. According to the World Health Organization report of 2000[2] a total of 32 million Indians were diabetics and the International Diabetic Federation estimates that this will further increase to 69.9 million by the year 2050[3]. Diabetes mellitus (DM), one of the most important risk factors for the development of coronary artery disease (CAD), is recently considered as a CAD risk equivalent[4]. Many epidemiologic studies have shown that diabetes mellitus, with associated macrovascular complications, is associated with a 2-4-fold increased incidence of CAD[5-6].

This increased incidence and predominance of CAD is seen even during the stage of impaired glucose tolerance (IGT), which precedes the clinical manifestation of diabetes mellitus[6,10]

Moreover, it has been reported that diabetics with CAD suffer from a higher mortality rate than nondiabetics with a relative risk of cardiac death two to three times higher in diabetic men and three to five times in women, compared with the general population[10-12]

It is well known based on postmortem[13-14], as well as angiographic investigations, that CAD in diabetics is more severe and diffuse[15-16]. There are however, researches that contradict these observations[17-18]

Conclusions regarding the distribution of CAD are also controversial. Some, mainly old, studies found that CAD in diabetes mellitus is characterized by more stenoses in the distal segments of the vessels,[19-20] whereas others found no difference between the proximal and distal segments.[15,18]

Furthermore, apart from some post-mortem and angiographic studies which refer to the CAD in diabetics, recently there have been very few comparative angiographic studies comparing the severity and distribution of CAD in diabetics and nondiabetics in detail.

Hence, this study titled comparative angiographic profile in diabetics and non-diabetic patients with acute coronary syndrome, is undertaken as an attempt to find, how ACS in diabetics differ from that of non-diabetics, with special interest on their angiographic profile among south Indian population. Also, we will try to fill some of these gaps and further reconcile the contradictory findings regarding the angiographic study of CAD.

Methodology

All of the patients were inquired of in detail about case histories, which included sex, age, family history of DM, family history of CAD, history of smoking, history of

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drinking, history of myocardial infraction, history of any other diseases, and information on drug treatment. The anthropometric measurements such as body height, body mass, waist circumference, hip circumference, and blood pressure were determined by the same physicians from our department with BMI and waist to hip ratio (WHR) being calculated as well. The smoking status was divided into 3 categories: never smoking, no cigarette smoking for >5 years, and currently a cigarette smoker. In the same way, the drinking status was also divided into 3 categories: never drinking, no alcohol drinking for >5 years, and currently a drinker. Myocardial infarction (MI) was confirmed by more than two cardiologists using the criteria jointly recommended by the European Society of Cardiology and the American College of Cardiology. Duration of CAD was calculated from the day when subjects first accepted angiography or MI first happened. Coronary angiography and diagnosis criteria for CAD Selective coronary angiography was performed with Judkin technique in all patients. The severity of coronary atherosclerosis was estimated by calculating the coronary atherosclerosis score (CAS), which is based on the number of stenotic coronary artery segments, the degree of their lumen stenosis. The extent and severity of the CAD was assessed by assigning points to each lesion as follows: less than 50% stenosis of the luminal diameter, 1; 50–74% stenosis, 2; 75–99%, 3; and total obstruction, 4. The points for each lesion in coronary arteries including proximal, medial, and distal segments were summed and a cumulative CAS obtained. The severity of the CAD was further classified as one-, two-, or three-vessel disease according to the number of stenotic coronary artery in the three major vessels. Significant CAD was defined as more than 50% stenosis in at least one coronary artery segment. The clinical features and the data from selective coronary angiographies were compared between the diabetic and nondiabetic CAD patients.

RESULTS

Table 1 shows that out of 51 Diabetic, 32 (62.74%) were Males and 19 (37.25%) were Females. And out of 51 Non-Diabetic, 49 (96.07%) were Male and only 2 (3.92%) were Female. The occurrence of ACS in Females found to be more in Diabetic group than in Non–Diabetic group.

Table 2 shows age distribution between the groups. In Non-Diabetic group, 16(31.4%) of ACS patient falls in fourth decade and 15(29.4%) falls in fifth decade. Similarly, in Diabetic group, 15(29.4%) falls in fourth decade and 21(41.1%) falls in fifth decade. In both the group, maximum number of ACS patient falls in the fourth and fifth decade.

Table 3 shows shows the comparison of LAD, LCX and RCA involvement between the Groups. Out of 51 Non-Diabetic, 33(64.7%) had LAD involvement. And out of 51 Diabetic, 42(82.4%) had LAD involvement. $p=0.043<0.05$ which shows statistical significance between LAD and Groups.

Out of 51 Non-Diabetic, 19(37.3%) had LCX involvement. And out of 51 Diabetic, 26(51.0%) had LCX involvement. $p=0.163>0.05$ which shows no statistical significance between LCX and Groups.

Out of 51 Non-Diabetic, 15(29.4%) had LCX involvement. And out of 51 Diabetic, 22(43.1%) had LCX involvement. $p=0.149>0.05$ which shows no statistical significance between RCA and Groups.

Out of 51 Diabetic, 3(5.9%) had LMCA involvement. No LMCA involvement in Non-Diabetic noted. $p=0.243>0.05$ which shows no statistical significance between LMCA and Groups.

Table 4 shows comparison of Single Vessel Disease (SVD), Double Vessel Disease (DVD) and Triple Vessel Disease (TVD) involvement between the groups. In Non-Diabetic group, 39(76%) ACS patient had SVD while in Diabetic group, 25(49%) ACS patient had SVD. $\chi2=8.220$, $p=0.004<0.01$ which shows highly statistical significance between single vessel and Groups.

In Non-Diabetic group, 8(15.7%) patient had Double vessel disease while in Diabetic group, 12 (23.5%) had Double-vessel disease. $\chi2=0.995$, $p=0.318>0.05$ which shows no statistical significance between double vessel and Groups.

In Non-Diabetic group, 4(7.8%) patient had Triple-vessel disease while in Diabetic group, 14(27.5%) had Triple-vessel disease. $\chi2=6.746$, $p=0.018<0.05$ which shows statistical significance between triple vessel and Groups.

Table 5 shows incidence of Single Vessel Disease (SVD) and Multi-Vessel Disease (DVD/TVD) involvement between the groups. In Non-Diabetic group, 39(76%) ACS patient had SVD while in Diabetic group, 25(49%) ACS patient had SVD. $\chi2=8.22$, $p=0.004<0.05$ which shows statistical

Gender Incidence		
	T2DM	NON T2DM
Male	32	49
Female	19	2
Total	51	51

Table-1: Gender distribution

Age Group	NON T2DM	
20-30	4(7.8%)	0
31-40	7(13.7%)	3(5.9%)
41-50	16(31.4%)	15(29.4%)
51-60	15(29.4%)	21(41.1%)
61-70	9(17.6%)	12(23.5%)
Total	51	51

Table-2: Age Distribution

		DM		Total	P value
		Non T2DM	T2DM		
LAD	Count	33	42	75	0.043
	%	64.7%	82.4%	73.5%	
LCX	Count	19	26	45	0.163
	%	37.3%	51.0%	44.1%	
RCA	Count	15	22	37	0.149
	%	29.4%	43.1%	36.3%	
LMCA	Count	0	3	3	0.243
	%	0.0%	5.9%	2.9%	

			Groups		Total	χ 2 – value	p-value
			Non T2DM	T2DM			
Single vessel	Present	Count	39	25	64	8.220	0.004 **
		%	76.5%	49.0%	62.7%		
	Absent	Count	12	26	38		
		%	23.5%	51.0%	37.3%		
Total		Count	51	51	102		
		%	100.0%	100.0%	100.0%		
Double vessel	Present	Count	8	12	20	0.995	0.318 #
		%	15.7%	23.5%	19.6%		
	Absent	Count	43	39	82		
		%	84.3%	76.5%	80.4%		
Total		Count	51	51	102		
		%	100.0%	100.0%	100.0%		
Triple vessel	Present	Count	4	14	18	6.746	0.018 *
		%	7.8%	27.5%	17.6%		
	Absent	Count	47	37	84		
		%	92.2%	72.5%	82.4%		
Total		Count	51	51	102		
		%	100.0%	100.0%	100.0%		

** Highly Statistical Significance at $p < 0.01$,* Significant at $p < 0.05$ and # No Statistical Significance at $p > 0.05$

Table-4: Incidence of Single Vessel Disease, Double Vessel Disease and Triple Vessel Disease between the Groups.

Vessel involvement		
	T2DM	NON T2DM
SVD	25	39
DVD/TVD	26	12
Total	51	51

Table-5: Incidence of Multi-vessel Disease and Single Vessel Disease between the Groups

			DM		Total
			Non T2DM	T2DM	
Grades	1	Count	7	1	8
		%	13.7%	2.0%	7.8%
	2	Count	5	4	9
		%	9.8%	7.8%	8.8%
	3	Count	15	9	24
		%	29.4%	17.6%	23.5%
	4	Count	12	14	26
		%	23.5%	27.5%	25.5%
	5	Count	12	23	35
		%	23.5%	45.1%	34.3%
Total		Count	51	51	102
		%	100.0%	100.0%	100.0%

P value = 0.045 <0.05, Significant.

Table-6: Severity of lesion between the groups.

Management		
	T2DM	NON T2DM
OMT	0	9
PTCA	25	36
CABG	26	6

Table-7: Comparison of Treatment options between the groups

significance between SVD and Groups.

In Non-Diabetic group, only 12(23%) ACS patient had Multivessel disease while in Diabetic group, 26 (51%) ACS patient had Multi-vessel disease. $\chi 2=8.22$, $p=0.004 < 0.05$ which shows statistical significance between Multivessel disease and Groups.

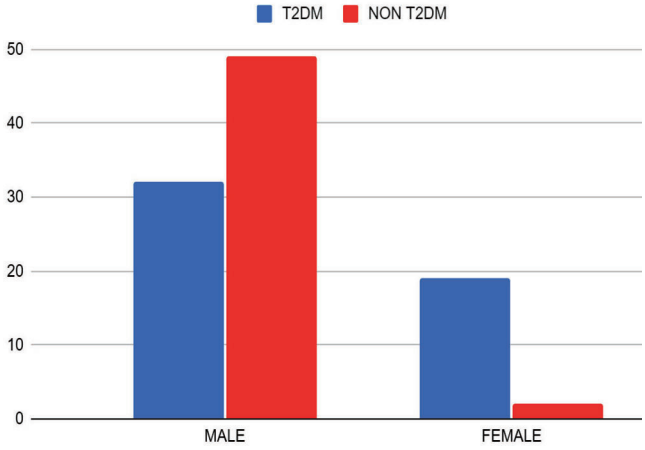

Figure-1: shows Gender distribution between Diabetic and Non-Diabetic

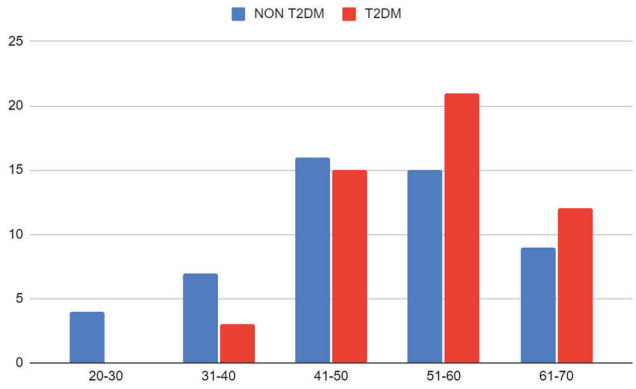

Figure-2: Age Distribution

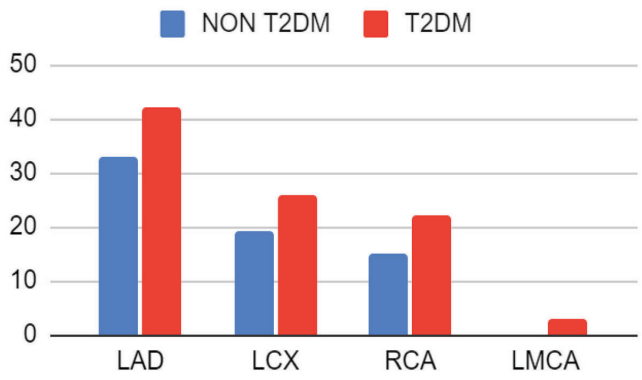

Figure-3: Individual vessel distribution between the groups.

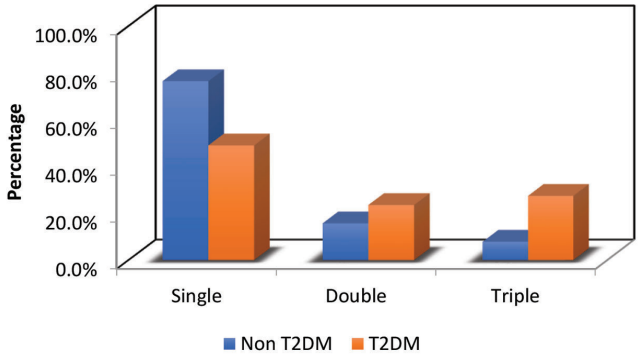

Figure-4: Number of vessels involved between the Groups.

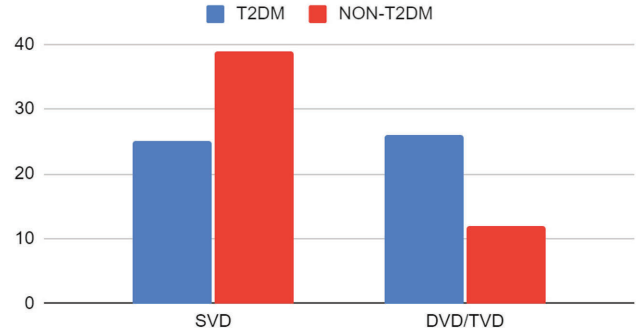

Figure-5: Incidence of Multivessel disease (DVD-TVD) and Single vessel disease (SVD) between the groups.

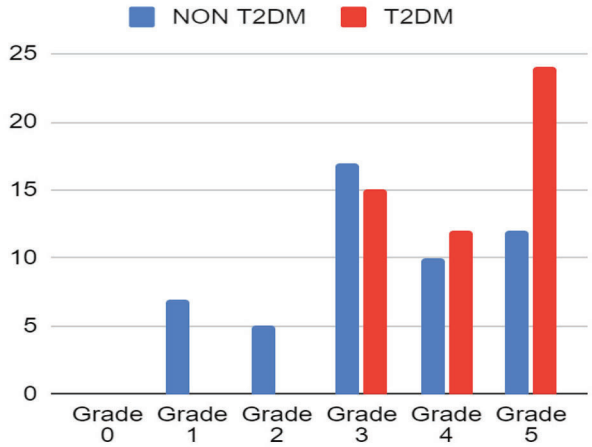

Figure-6: Severity of lesion between the groups.

Table 6 shows severity of lesions between the groups.
Out of 51 Non-Diabetic, 7(13.7%) has grade 1, 5(9.8%) has grade 2, 15(29.4%) has grade 3, 12(23.5%) has grade 4 and 12(23.5%) has grade 5 stenosis respectively.
And Out of 51 Diabetic, 1(2.0%) has grade 1, 4(7.8%) has grade 2, 9(17.6%) has grade 3, 14(27.5%) has grade 4 and 23(45.1%) has grade 5 stenosis respectively.
Severity of stenosis ranging from grade 4-5 was noticed in 72.55% of the diabetics compared to 47.05% in non-diabetics.
Total occlusion or grade 5 stenosis was significantly high in diabetics as compared to non-diabetics.

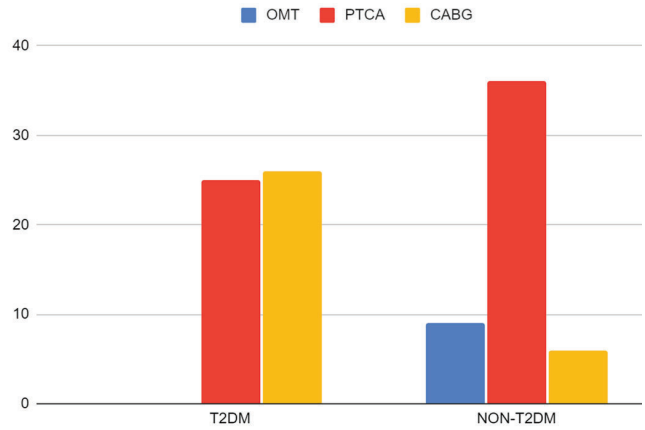

Figure-7: Treatment Options.

Table 6 shows comparison of treatment options between the groups. Majority of diabetic patients 26 (51%) require CABG as treatment option compared to 6(11.7%) of non-diabetics. PTCA is preferred in 36(70.6%) of non-diabetics compared to 25(49%) of diabetics. Medical line of management was required in 9(17.6%) of non-diabetics.

DISCUSSION

The present study of 51 diabetic patients and 51 non-diabetic patients with CAD were analysed with special emphasis laid on the coronary angiographic findings in acute coronary syndrome (ACS). Our results were compared with similar studies done earlier.

Age Incidence

In the present study it was seen that the peak incidence of ACS in diabetics was in the fourth and fifth decade similar to fourth and fifth decade in non-diabetics. However, Srinidhi S. et al showed peak incidence in fourth and fifth decade[25]. This finding correlated with DiabCare Asia--India Study: diabetes care in India–current status[26].

Sex Incidence

In our study the incidence of ACS in males was 62.74% in diabetics and 96.07% in non-diabetics. In females the incidence of ACS was 37.25% in diabetics and only 3.92% in non-diabetics. The risk of developing ACS in females was more in diabetics compared to non-diabetics. This finding was similar to study done by Srinidhi S. et al[25]. Most of the patients in our group were males constituting 79.4% of the total while females constituted 20.6%. However, Ramachandran et al in their National Urban Diabetes Survey[28] showed that there is no gender difference between

diabetics while Natali[29] found that the incidence of diabetes was more in females. This discrepancy in our study can be attributed to the fact that our study group was primarily constituted by those diabetic patients who had a class I indication for coronary angiography.

Angiographic Profile

In our study, coronary angiography revealed that the incidence of multivessel disease in diabetics was much higher (51%) compared to non-diabetics which was only 23%. This finding correlates with the other study by Singh RB, Niaz MA[30], showed higher incidence of MVD in diabetics (57.3%) compared to 41.3% in non-diabetics. In another study conducted at CMC Vellore also showed that MVD was more common in diabetics (87.5% Vs 79.6%) in two separate groups of 516 diabetic and non-diabetic patients[31]. Sousa JM et al., showed severe three-vessel disease was significantly more frequent in diabetic patients (28% x 10%), $p < 0.005$[32]. The commonest vessel involved in our study was LAD (46.7%) in both groups followed by LCX (28.9%) and RCA (24.4%). This finding contradicts with study done by Tong-guo wu et al where the most commonly involved coronary artery in diabetic patients was the left circumflex artery, followed by the left descending artery, and the right and left main coronary arteries[33]. Ming -Hui gui et al found that the right coronary artery was significantly more frequently involved in diabetics[21]

In our study, significant left main disease and left main disease associated with double or triple vessel disease was significantly more in diabetics (3 and 0, 5.9% and 0%, respectively, $p> 0.05$). Cariou[34] had also more left main CAD (7/50 vs 1/50, $p < 0.05$) though he did not find at any time a statistical difference for MVD.

Severity of stenosis ranging from grade 4-5 was noticed in 72.55% of the diabetics compared to 47.05% in non-diabetics. Total occlusion or grade 5 stenosis was significantly high in diabetics as compared to non-diabetics. Hence the extent and severity of coronary artery disease was significantly high in diabetic patients with acute coronary syndrome when compared to Non diabetic with acute coronary syndrome.

These findings were similar in other studies like Mahdi Mossavi et al[35], Uddin SN et al[36], Nichoils et al[37] where they found the angiographic extent and severity of coronary artery disease was high in diabetic patients with acute coronary syndromes.

Majority of diabetic patients (51%) require CABG as treatment option compared to 11.7% of non-diabetics. This finding was similar to the study done by Srinidhi S. et al[25] where 46% of Diabetic require CABG as treatment option compared to 16% of Non-diabetics.

CONCLUSION

This study showed that the severity and extent of CAD and incidence of triple/multi vessel disease was significantly high in diabetics when compared to non-diabetics with ACS.

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