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Original article:

Coronary Artery Disease Patterns Among Diabetics Undergoing Coronary Angiography at Goa Medical College Hospital

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ABSTRACT:

Background: Diabetes Mellitus (DM) shares a common pool of risk factors with Coronary Artery Disease (CAD) apart from being its independent risk factor. Objectives of this study were- to study the sociodemographic, clinical and laboratory profile of diabetics undergoing coronary angiography; and to compare the patterns of CAD among DM and non-DM patients

Material and Methods: A cross-sectional study was conducted among nine hundred and seventy eight patients who came for coronary angiography at Department of Cardiology- Goa Medical College (India) from August 2018 to January 2019. Relevant data was collected using a semi-structured questionnaire administered by trained medical interns. The data was analysed using SPSS for windows 22.0 and expressed as proportions and means. Independent sample t-test, ANOVA and χ^2 (chi-square tests) were used to test significance of difference between means and proportions.

Results: Diabetics accounted for 53.6% of the patients who underwent coronary angiography, and majority were males. Difference in patterns of CAD between diabetics and non-diabetics was found to be statistically significant with diabetics being more likely to have a double or triple vessel involvement. However, the mean Hba1c levels did not differ significantly across the CAD patterns. Diabetics were significantly more likely to have hypertension (*p=0.000*), dyslipidemia (*p=0.000*), sedentary lifestyle (*p=0.001*); and were more likely to use alcohol (*p=0.000*) and tobacco (*p=0.015*) compared to the non-diabetic counterpart.

Conclusion- Diabetics are not only more prone to have a coronary blockade but also have a severe coronary artery disease compared to non-diabetics. A good metabolic control encompassing control of blood pressure, lipids, weight and glycaemia would go a long way in averting cardiovascular complications of diabetes.

Key words: Diabetes Mellitus; Coronary Artery Disease; Patterns; Risk Factors; Profile

Introduction:

Though India has gained the dubious distinction of being the Diabetes Capital of the World, it is far from being the Diabetes Care capital of the World. Given the lifelong and progressive nature of the disorder, diabetics deserve a continuum of care with early diagnosis and rigorous follow up to avert complications. Diabetes is a coronary artery disease equivalent,[1] and cardiovascular

diseases account for a major chunk of mortality and morbidity among diabetics, [2-4]. CAD hits diabetics earlier and harder as compared to their non diabetic counterparts.[1] Patients with diabetes aggregate other comorbidities such as obesity, hypertension, and dyslipidemia which account for this increase in the risk for CVD.[1,5] Although a lot of research has gone and is still going, on factors associated with CAD among diabetics there is no regional data specific to the State of Goa. Goa is a highly urbanized state with sociodemographic characteristics that are distinct from the national average, thus necessitating a thorough insight in to how DM influences the occurrence of CAD in this part of the Konkan belt. Goa Medical College Hospital (GMCH) established the Department of Cardiology and Cardiovascular Thoracic Surgery in the year 2015. Being the only State sponsored tertiary hospital most patients with acute coronary events prefer to avail of cardiac care at the medical college hospital. A system of collection of sociodemographic, clinical and laboratory data pertaining to the patient undergoing Coronary angiography (CAG) was initiated at the Department of Cardiology, with the help of Department of Preventive & Social Medicine from August 2019. This research paper presents the findings of the analysis with respect to the patients with DM who underwent CAG at the Dept of Cardiology, GMCH with the following objectives-

1. To study the sociodemographic, clinical and laboratory profile of the diabetics undergoing CAG at the Dept of Cardiology, GMCH
2. To compare the patterns of Coronary Artery Disease (CAD) among diabetics and non-diabetics undergoing CAG at the Dept of Cardiology, GMCH

Materials and methods:

This Cross-Sectional Descriptive study was carried out among nine hundred and seventy eight consecutive patients who underwent CAG at the Dept of Cardiology- GMCH during the period August 2018 to February 2019. The patients undergoing CAG as a pre-operative work-up for valvular repair surgeries were excluded from the analysis. The study protocol was approved by the Institutional Ethics Committee of the Goa Medical College Hospital, Bambolim-Goa. The patients were enrolled in the study following their written informed consent. Data collection was done by trained interns in face to face interview, using a semi-structured proforma, with the patients as well as by going through their hospital records. A detail information pertaining to the socio-demographic parameters of the patient, diet, physical activity, medical history, regularity of follow up, indication for CAG and its outcome; along with the relevant clinical and laboratory measurements was collected.

The patterns of occlusion on CAG were classified as Normal- clinically insignificant coronary occlusion; SVD, single vessel disease; DVD, double vessel disease; and TVD, triple vessel disease. Obesity was defined as per the consensus statement for diagnosis of obesity, abdominal obesity and metabolic syndrome for Asian Indian adults[6] as Body Mass Index (BMI) of more than 24.9 Kg/m^2 and overweight as BMI of 23 to 24.9kg/m^2. Use of coconut in the diet was classified as Prominent- presence of coconut in all three major meals of the day (breakfast, lunch and dinner) on most days of a week, Moderate- daily presence of coconut in one or two major meals of the day on most days of a week, and Inconspicuous- no coconut consumed on most days of a week.

Statistical Analysis:

The data was entered and analysed using the SPSS, version 22. The variables are described as proportions, and means with their standard deviations depending on the type of the variable. The statistical significance of difference in proportions was assessed using the Chi square test, and for means was assessed using the independent sample t-test

and ANOVA (Analysis of variance) at 5% level of significance.

Results:

Of the 978 patients who underwent CAG during the reference period 524 (53.6%) had diabetes. The mean duration of DM was estimated to be 10.78 years (SD 7.180). Table 1 presents the age distribution of the study population and the proportion of DM patients across the age groups.

The study population consisted of 73.4% males and 26.6% females, and the proportion of diabetics in the respective sex categories was 51.5% and 59.2%(χ^2 = 4.5487, df=2, *p=0.032)*.

Table 1: Age-Sex Distribution of the the Diabetics in the Study Population

Age-Group	Total	Sex			
		Male		Female	
		Total Males	DM Males	Total Females	DM Females
30 or less	2	0	0	2	2 (100%)
31-40	50	46	12 (5.5%)	4	2 (50%)
41-50	136	108	52 (48.1%)	28	8 (28.6%)
51-60	328	238	132 (55.5%)	90	56 (62.2%)
61-70	336	228	126 (55.3%)	108	66 (75%)
>70	126	98	48 (49%)	28	20 (71.4%)
Total	978	718	370 (51.5%)	260	154(59.2 %)

The difference in the proportion of patients undergoing CAG across the age groups in males and females was found to be statistically significant (χ^2=23.501, df=5, *p=0.001*). Average age at CAG among DM was 60.44 years(SD 9.623), and among non-DM was 57.96 years (SD 11.125); the difference was found to be statistically significant (t= 3.73,*p<0.000*). Table 2 & 3 present the differences among the diabetic and non-diabetic patients depending on selected sociodemographic and clinical variables.

Table 2: Background Socio-Demographic Characteristics of Diabetes Patients

	N	DM	%	χ^2	*P*
Religion					
Hindu	682	316	46.3	56.807	**0.000**
Catholic	220	166	75.5		
Muslim	76	42	55.3		
Residence					
Urban	358	182	50.8	3.195	0.15
Rural	620	342	55.2		
Marital Status					
Married	896	460	51.3	21.548	**0.000**
Non-married	82	64	78		
Education					
Literate	74	24	32.4	20.752	**0.000**
Primary	86	38	44		
Up to Tenth	500	278	55.6		
Graduate	318	184	57.9		

Table 3: Background Clinical Characteristics of the Diabetes Patients

	N	DM	%	χ^2	*p*
Hypertension					
Yes	662	412	62.2	61.734	**0.000**
No	316	112	35.4		
Dyslipidemia					
Yes	262	168	64.1	15.995	**0.000**
No	716	356	49.7		
Tobacco					
Yes	212	98	46.2	5.883	**0.015**
No	766	426	55.6		
Alcohol					
Yes	446	272	61	18.09	**0.000**
No	532	252	47.4		
Non-Exercise Activity Time					
Mostly Sitting	454	270	59.5	13.339	**0.001**
Mostly Standing	164	86	52.4		
Mostly walking	360	168	46.7		
Exercise					
Yes	290	168	57.9	3.14	0.076
No	688	356	51.7		
Diet					
Non Veg	952	514	54	2.454	0.457
Veg	26	10	38.5		
Stature					

Underweight	62	34	54.8	3	0.378
Normal	262	128	48.9		
Overweight	112	62	55.4		
Obese	540	298	55.2		

Table 4 presents the Outcome of Coronary Angiography in terms of the number of vessels involved(Normal, clinically insignificant coronary occlusion; SVD, single vessel disease; DVD, double vessel disease; and TVD, triple vessel disease).

Table 4: Outcome of CAG among Diabetics and Non-Diabetics

Outcome	DM		Total
	Yes	No	
Normal	96(18.3%)	116(25.6%)	212(21.7%)
SVD	148(28.2%)	184(40.5%)	332(33.9%)
DVD	136(26%)	74(16.3%)	210(21.5%)
TVD	144(27.5%)	80(17.6%)	224(22.9%)
Total	524	454	978

The difference in the pattern of CAD was statistically different among diabetics compared to the non-diabetes (χ^2= 37.563, *p=0.000*). Stratification of post-CAG recommendations is presented in Table 5 and the difference among diabetics and non-diabetics was statistically significant (χ^2=18.291, *p=0.000*). Table 6 summarises few clinic-social factors associated with the extent of coronary blockade among diabetics and non-diabetics.

Table 5: Post-CAG Recommendations among Diabetics and Non-Diabetics

Post-CAG Recommendations	DM		Total
	Yes	No	
Medical management	118 (22.5%)	152 (33.5%)	270 (27.6%)
PTCA with Stent	254 (48.5%)	210 (46.3%)	464 (47.4%)
CABG	152 (29%)	92(20.2%)	244 (24.9%)
Total	524	454	978

Table 6: Clinico-social factors associated with Outcomes of CAG (figures represent percentages of the total diabetics and non-diabetics in the respective rows)

	Outcome				
	Normal	SVD	DVD	TVD	P
Age Group					
30 or less	0/-	0/-	100/-	0/-	
31-40	0/33.3	57.1/44.4	0/11.1	42.9/11.1	0.067
41-50	10/26.3	40/44.7	23.3/10.5	26.7/18.4	0.025
51-60	20.2/31.4	36.2/37.1	24.5/17.1	19.1/14.3	0.066
61-70	21.9/23.6	20.8/43.1	30.2/18.1	27.1/15.3	0.00003
More than 70	14.7/10.3	11.8/34.5	23.5/20.7	50/34.5	0.022
Sex					
Male	11.4/17.8	27.6/45.4	27.6/16.7	33.5/20.1	0.00001
Female	35.1/50.9	29.9/24.5	22.1/15.1	13/9.4	0.08
Religion					
Hindu	17.7/23	29.1/43.2	27.2/15.8	25.9/18	0.00001
Catholic	19.3/40.7	30.1/25.9	19.3/11.1	31.3/22.2	0.013
Muslim	19/29.4	14.3/35.3	42.9/29.4	23.8/5.9	0.027
Hypertension					
Yes	18.4/24	27.7/38.4	25.7/17.6	28.2/20	0.0008
No	17.9/27.5	30.4/43.1	26.8/14.7	25/14.7	0.0013
Dyslipidemia					
Yes	26.2/14.9	25/38.3	23.8/25.5	25/21.3	0.058
No	14.6/28.3	29.8/41.1	27/13.9	28.7/16.7	0.00001
Tobacco					
Yes	12.2/10.5	26.5/47.4	34.7/24.6	26.5/17.5	0.018
No	19.7/30.6	28.6/38.2	23.9/13.5	27.7/17.6	0.00001
Alcohol					
Yes	14/17.2	33.1/51.7	27.9/16.1	25/14.9	0.00008
No	23/30.7	23/33.6	23.8/16.4	30.2/19.3	0.0004
NEAT					
Mostly Sitting	20.7/29.3	24.4/41.3	25.9/9.8	28.9/19.6	0.00001
Mostly	23.3/35.	37.2/35	14/15.4	25.6/12	0.1258

Standing	9	.9		.8	
Mostly walking	11.9/17.7	29.8/41.7	32.1/22.9	26.2/17.7	0.0101
Exercise					
Yes	14.3/24.6	41.7/45.9	21.4/8.2	22.6/21.3	0.006
No	20.2/25.9	21.9/38.6	28.1/19.3	29.8/16.3	0.00001
Diet					
Non veg	17.9/25.6	28.4/40.6	26.1/16	27.6/17.8	0.00001
Veg	40/25	20/37.5	20/25	20/12.5	0.71
Coconut Use					
Prominent	14.9/28.3	27.3/38.6	24/16.5	33.8/16.5	0.00001
Moderate	23.6/20.8	30.2/42.7	27.4/16.7	18.9/19.8	0.019
Inconspicuous	Nil/50	Nil/50	100/Nil	Nil/Nil	
Stature					
Underweight	29.4/14.3	29.4/64.3	11.8/7.1	29.4/14.3	0.055
Normal	10.9/20.9	26.6/38.8	25/20.9	37.5/19.4	0.0017
Overweight	19.4/44	29/32	35.5/4	16.1/20	0.0003
Obese	20.1/25.6	28.9/40.5	26.2/17.4	24.8/16.5	0.001
Menstrual Status					
Pre-Menopausal	25/66.7	37.5/22.2	25/0	12.5/11.1	0.09
Post-Menopausal	36.2/41.9	27.5/25.6	20.3/20.9	15.9/11.6	0.74

Among diabetics, the outcome of CAG was associated significantly with all the variables considered in Table 6 except Religion, p=0.054; Education,p= 0.835; Hypertension, p= 0.897; Tobacco, p=0.105; and Diet,p= 0.361. Among the non-diabetics the association between the independent variables and the outcomes of CAG (Table 6) was not statistically significant for Hypertension, p= 0.897; and Diet, p=0.788. The statistical significance of the difference in outcomes of CAG among diabetics and non-diabetics across each stratum of the variables is mentioned in Table 6. Table 7 shows the mean HbA1c levels across the CAG outcomes.

Table 7: Mean HbA1c levels across the CAG outcomes

CAG Outcome	N	Mean	SD
Normal	16	7.4375	1.45413
SVD	34	7.6000	1.93970
DVD	36	7.7222	1.87542
TVD	46	7.5087	1.68442
Total	132	7.5818	1.76470

F=0.136,p=0.938

Of the 524 diabetes patients HbA1c levels were available only among 132 (25.2%) of the patients. The mean HbA1c levels among these patients did not differ significantly across the CAG outcomes.

Discussion:

DM represents a conglomeration of conventional CVD risk factors, apart from being an independent risk factor for CVDs.[1,2,5,7] Although the underlying atherosclerotic process does not differ significantly between diabetics and non-diabetics, it is postulated that the procoagulant-prothrombotic state resulting from the excessive expression of glycoprotein IIb/IIIa, increased plasminogen activator inhibitor type 1, and reduced levels of circulating anticoagulants like protein c and antithrombin III account for higher and severe CAD in diabetics.[2,8] A study among 106 consecutive women undergoing CAG in Kuwait showed that 72% had DM.[9] a study among South Asians settled in New York revealed that 55% of those who underwent CAG were diabetics.[10] In our study almost 54%-, 51.5% males and 59.2% females- who underwent CAG during the study period had DM. The frequency of CAD necessitating a coronary intervention among the DM patients was 81.7% as compared to 74.4% among the non-DM patients (p=0.007). For the sake of discussion the terms Mild CAD is used to denote the Single Vessel Disease or clinically insignificant blockade not necessitating coronary intervention (Normal/ Non-obstructive coronaries). The non-DM patients were more likely to have a SVD compared to

their diabetic counterparts, 40.5% & 28.2% respectively (p<0.05). The severe forms of CAD (DVD/TVD) were more common among DM than the non-DM patients, 53.5% & 33.9% respectively (p<0.05). Thus it was found that the Diabetics were not only more likely to have a positive finding on CAG, but also they were more likely to have a more severe CAD compared to the non-diabetics. This fact is also reinforced in the observation wherein the Coronary Artery Bypass Graft (CABG) was more likely to be recommended among diabetics than the non-diabetics- 29% & 20.2% respectively (p=0.001). The Coronary Artery Surgery Study (CASS) among more than 15000 patients across the United States demonstrated an independent association between DM and the severity of CAD.[11] A study among 1100 patients in Iran found that the proportion of diabetics and non-diabetics having a SVD was 22.7% v/s 62.3%, DVD was 18.7% v/s 25.3%, and TVD was 58.7% v/s 12.5%.[12] A similar study in diabetics in Pakistan revealed that 24.3%, 33.4%, 29.5% and 20.9%, respectively, had no CAD, SVD, DVD or a TVD.[13] Multiple vessel involvement was seen in 44% of the diabetics and 16% non-diabetics undergoing CAG at a hospital in Davangere-India.[14] The patterns of CAD were expected to correlate well with the degree of glycemic control as reflected by Hba1c. However, the HbA1c values, in our study, did not differ significantly across the different patterns of CAD in diabetics. Given the fact that HbA1c values were available in only 25.2% of the diabetes case files, an absence of statistically significant difference in the A1c values across the CAD patterns could be attributed to this information bias. Poor attention of treating physicians to the average blood glucose level has been a serious dent in the Standards of Diabetes Care, and has been well documented [15,16]. A study on assessment of metabolic control among diabetics in primary care settings across the state of Goa (India) revealed that HbA1c levels were estimated in less than one third of the diabetics.[16] Untraceable A1c levels in almost 75% of the diabetes patients with potential CAD, in our study, further emphasizes the need for improved diabetes care practices in the state of Goa. Moreover, given the slow and insidious evolution of CAD in presence of other predisposing and protective factors, whether, or not, a three months average of blood glucose would correctly correlate with the severity of CAD- is a valid question for consideration as there is sufficient evidence indicating that glycemic variability has more significant implications on the pathophysiology of CAD in diabetics compared to the chronic sustained hyperglycemia as reflected by the HbA1c.[17-19]

CAD is multifactorial in origin and the strength of association between CAD and its individual risk factors may be confounded by the presence of multiplicity of such factors. Statistically, Multiple Logistic Regression (MLR) gives a good idea of relative importance of individual risk factors in the final statistical output. However, the interplay of these risk factors is often bypassed in a software based model of MLR. Startification is another statistical method for eliminating the confounding influences, and it also allows to take a closer look at how the presence of one variable would influence the effect of the other variable on the outcome. The various risk factor variables were, therefore, stratified among the DM and the non-DM patients, and the impact of DM in influencing the CAD outcome was studied.

Males accounted for 73.4% (718/978) of all the patients who underwent CAG during the reference period. Male preponderance (67.5% to 76.4%) among those undergoing CAG has been observed and confirmed through studies in Iran, [12] Pakistan [13] and India [20]. The proportion of DM was more among females (59.2%) compared to the males (51.5%), p=0.03. A study in Punjab also confirmed higher prevalence of DM among females who reported for CAG compared to males.[21] Non diabetics males were more likely to have normal coronaries (not necessitating a

coronary intervention) or a single vessel disease compared to their diabetic counterparts, 58.2% as against 39% (p=0.00001). As a corollary to this, the diabetic males had a significantly higher proportion of Double and Triple Vessel Disease compared to the non diabetics. However, the patterns of CAD among diabetic and non-diabetic females did not differ in a statistically significant manner. The protective influence of female sex against the CAD is attributed to the cardioprotective effect of female sex hormones, especially the estrogen mediated changes in lipid profile, endothelial nitric oxide production, and regulation of vascular smooth muscle cell calcium and potassium channels.[22] To further elucidate the mystery behind why the CAD patterns did not differ significantly among diabetic and non-diabetic females, the females were further stratified based on their menopausal status. It was found that the CAD pattern did not differ significantly among the diabetic and non-diabetic women depending on their menstrual status. The protective influence of female sex hormones, thus, seems to over-ride the effect of DM in the pathophysiology of CAD in females.

Among the diabetics 78.6% had Hypertension (HT) compared to 55.1% in the non-diabetics (Table 3). HT was found to complement the effect of DM on CAD, with diabetic hypertensives (DM-HT) having more severe outcomes in terms of Double and Triple vessel involvement (54.4%) compared to diabetic non-hypertensives (48.9%), non-diabetic hypertensives (37.7%) and non-diabetic non-hypertensives (29%)- p=0.000. Concurrence of HT with DM and its adverse influence on CAD is emphasized through medical literature worldwide [1,7], and is attributable to hyperinsulinemia, extracellular fluid volume expansion and increased arterial stiffness.[7]

Higher proportion of diabetics in this study had dyslipidemia compared to the non-diabetics, 32% v/s 18.5% (Table 3). This fact is endorsed in systemic reviews [2]. High levels of triglycerides, apolipoprotein B and VLDL induced by increased free fatty acids released from insulin resistant fat cells are known to influence the CVD risk. [2] However, in this study no statistically significant difference could be deduced in the outcomes of CAG in diabetics and non-diabetics among the dyslipidemic patients (p= 0.058, Table 6). On the contrary among those without dyslipidemia, non-diabetics had a better CAG outcome compared to their diabetic counterparts. It is noteworthy that all the dyslipidemic patients were on statins. Statins are known to offer clinical benefits beyond lipid control in terms of stabilization of atheromatous plaque, increased bioavailability of nitric oxide, anti-inflammatory effect and anti-oxidant effect. [23] Thus, dyslipidemic patients, by virtue of being on statins reaped its pleiotropic benefits thereby possibly accounting for less severe CAG outcomes compared to the non-dyslipidemic patients. This finding forms a strong case for routine prescription of statins for all diabetes patients irrespective of their baseline lipid levels for primary prevention of CVDs.[3,24]

Diabetes seemed to amplify the effect of tobacco and alcohol on severity of CAD, with diabetic tobacco users and diabetic alcohol users having a higher representation in the double and triple vessel disease categories compared to the normal and single vessel disease categories. Though studies have conclusively proven the deleterious effects of tobacco on cardiovascular health [25], the beneficial effects of moderate alcohol consumption through its effects on lipid metabolism and haemostatic factors, and the exact mechanism underlying such an effect remains controversial and incompletely understood [26].

Non-exercise activity Thermogenesis (NEAT) accounts for day to day physical activity performed by an individual towards his routine demands like fidgeting, spontaneous muscle contraction and maintaining posture. [27] Diabetics, in sedentary as well as mostly walking category, had a significantly severe CAG outcome compared

to the non-DM. However, the ones in mostly standing occupation did not differ significantly with regards to their CAG outcomes. It is noteworthy that women, mostly housewives, accounted for a significant proportion of the patients in the latter category, and therefore we analysed the data among the diabetic and non diabetic males across their NEAT levels. However, the difference in outcomes of CAG between diabetics and non-diabetics in mostly standing category was not found to be statistically significant. Diabetics as well as non-diabetics who engaged themselves in at least 150 minutes of weekly physical activity apart from their day to day essential movements were more likely to have milder form of CAD compared to those who did not comply with the prescribed limit of exercise. Effect of physical activity in reducing cardiovascular as well as total mortality in Type 2 diabetics has been documented through research studies. [28] However, the size of the effect in terms of the patterns of CAD did not differ significantly between DM and non-DM depending on whether they exercised or not. Thus, exercise did not seem to override the influence of DM in pathophysiology of CAD.

The prevalence of DM did not differ significantly across the different BMI groups. On an average, more than 50% of the Underweight, Normal, Overweight and Obese patients had DM. Almost one third of the diabetics were underweight or normal based on their BMI. Weaker association between BMI and Type 2 DM in Asian populations has been confirmed through literature review. [29] Severe outcome at CAG was more common among diabetics, compared to the non-diabetics, across all the BMI categories. Diabetics in the underweight category were more likely to have a mild CAG outcome (58.8%) compared to the other BMI categories. It is noteworthy that to balance the detrimental metabolic effect of DM the corresponding decline in the weight necessitated that the patients be in the Underweight category. Obesity is known to be an independent risk factor for CAD, and also synergises the effect of DM on aetiopathology of CAD. The lower threshold of BMI for its detrimental effect on cardiac health in Asian populations has been widely studied,[6,30] and is also evident from our study- 63% of the patients with Normal BMI had a Severe CAD, compared to 51% of the overweight and Obese diabetes patients.

Conclusion:

The study compares the outcome of Coronary Angiography between diabetes and non-diabetes patients, and confirms the hypothesis that type-2 DM patients are not only more likely to have a coronary artery blockade but also the multiple vessel involvement was more common compared to non-diabetics. Severe CAD at younger age among diabetics compared to their non diabetic counterparts reinforces the aggressive nature of this seemingly silent disorder. The study findings point at the poor quality of care received by diabetes patients as reflected by their unsatisfactory laboratory work-up. Diabetes is a coronary artery disease equivalent and measures to prevent CAD in these patients should highlight on meticulous evaluation and follow-up of all diabetics, advice on physical activity, and avoidance of tobacco. Routine prescription of statins for primary prevention of CAD in diabetics may also be considered considering its pleiotropic benefits.

Being a hospital based study the researchers had no control over selection of the patients, who were essentially self referred. Factors influencing the health seeking behavior of the patients in terms of whether to avail services at the government hospitals or a private hospital, and delayed reporting leading to death before reaching the hospital could have led to some loss of data. Laboratory work-up of the patients, even the in-patient work-up, was grossly inadequate thereby limiting the comparison of laboratory parameters in the study sub-groups. Despite these limitations this is the first study of its kind from Goa with a sample size of close to a thousand. Further research in to post-intervention prognosis of these patients by

their periodic follow-up, and its correlation with the degree of their metabolic control would be interesting.

References:

1.Mattos Matheus AS, Monteiro Tannus LR, Cobas RA, Sousa Palma CC, Negrato CA, Brito Gomes M. Impact of Diabetes on Cardiovascular Disease: An Update, Int J Hypertens. 2013; 2013: 653789. Doi: 10.1155/2013/653789

2.Leon BM, Maddox TM. Diabetes and cardiovascular disease: Epidemiology, biological mechanisms, treatment recommendations and future research, World J Diabetes 2015 ; 6: 1246–1258.

3.Demoz GT, Wahdey S, Kasahun GG, Hagazy K, Kinfey DG, Tasew H et al. Prescribing patterns of statins for primary prevention of cardiovascular diseases in patients with type 2 diabetes: insight from Ethiopia, BMC Res. Notes. 2019; 12:386.

4.Low Wang CC, Hess CN, Hiatt WR, Goldfine AB. Clinical Update: Cardiovascular Disease in Diabetes Mellitus: Atherosclerotic Cardiovascular Disease and Heart Failure in Type 2 Diabetes Mellitus - Mechanisms, Management, and Clinical Considerations, Circulation. 2016; 133:2459-502.

5.Aronson D, Edelman ER. Coronary artery disease and diabetes mellitus, Cardiol Clin. 2014; 32:439-455.

6.Misra A, Chowbey P, Makkar BM, Vikram NK, Wasir JS, Chadha D. Consensus Statement for Diagnosis of Obesity, Abdominal Obesity and the Metabolic Syndrome for Asian Indians and Recommendations for Physical Activity, Medical and Surgical Management, JAPI 2009;57: 163-170.

7.Chiha M, Njeim M, Chedrawy EG. Diabetes and Coronary Heart Disease: A Risk Factor for the Global Epidemic, Int J Hypertens. 2012; 2012: 697240. Doi: 10.1155/2012/697240

8.Morgan KP, Kapur A, Beatt KJ. Anatomy of coronary disease in diabetic patients: an explanation for poorer outcomes after percutaneous coronary intervention and potential target for intervention, Heart 2004; 90: 732–738.

9.Thomas CS, Cherian G, Hayat NJ, Varma NK. Angiographic comparison of coronary artery disease in Arab women with and without type II diabetes mellitus, Med Princ Pract 2002;11:63–8.

10.Silbiger JJ, Stein R, Roy M, Nair MK, Cohen P, Shaffer J et al. Coronary artery disease in South Asian immigrants living in New York City: angiographic findings and risk factor burdens, Ethn Dis. 2013; 23:292-5.

11.Alderman EL, Corley SD, Fisher LD, Chaitman BR, Faxon DP, Foster ED et al. Five-year angiographic follow-up of factors associated with progression of coronary artery disease in the coronary artery surgery study (CASS). CASS participating investigators and staff, J Am Coll Cardiol 1993; 22: 1141–54.

12.Naghshtabrizi B, Moradi A, Amiri J, Aarabi S, Sanaei Z. An Evaluation of the Numbers and Locations of Coronary Artery Disease with Some of the Major Atherosclerotic Risk Factors in Patients with Coronary Artery Disease, J Clin Diagn Res. 2017; 11: OC21–OC24.

13.Naqvi SH, Tun HN, Razzaq A, Zaffar Z, Ali SN, BabarH,et al. Angiographic Pattern of Coronary Artery Disease in Diabetic Patients Having Abnormal Ankle Brachial Index, Int J Clin Cardiol 2019; 6:154

14.Hegde SS, Mallesh P, Yeli SM, Gadad VM, Giri PM. Comparitive Angiographic Profile in Diabetic and Non-Diabetic Patients with Acute Coronary Syndrome, J Clin Diagn Res. 2014;8: MC07-MC10.

15.Chauvel N, Le Vaillant M, Pelletier-Fleury N. Variation in HbA1c prescription for patients with diabetes in French general practice: an observational study prior to the implementation of a P4P programme, Eur J Public Health. 2013;23:61-66.

16.Kamat US, Ferreira A.M.A. Assessment of metabolic control among the diabetics seeking care in primary care set-ups in Goa, India, Int J Diabetes Dev Ctries 2015; 35: 351–355.

17.Xia J, Yin C. Glucose Variability and Coronary Artery Disease, Heart Lung Circ. 2019;28:553-559.

18.Brownlee M, Hisch IB. Glycemic variability—a HbA1c independent risk factor for diabetic complications, JAMA 2006;29:1707–1708.

19.Nusca A, Tuccinardi D, Albano M, Cavallaro C, Ricottini E, Manfrini S et al. Glycemic variability in the development of cardiovascular complications in diabetes, Diabetes Metab Res Rev. 2018; 34:e3047.

20.Jain S, Sarkar NC, Sarkar P, Modi N, Tilkar M. Evaluation of Coronary Artery Status by Coronary Angiography after First Survival of Acute Myocardial Infarction, J Clin Diagn Res. 2015; 9: OC06–OC08.

21. Bajaj S, Mahajan V, Grover S, Mahajan A, Mahajan N. Gender Based Differences in Risk Factor Profile and Coronary Angiography of Patients Presenting with Acute Myocardial Infarction in North Indian Population, J Clin Diagn Res. 2016; 10: OC05.

22. Skafar D, Xu R, Morales J, Ram J, Sowers J. Female Sex Hormones and Cardiovascular Disease in Women, Journal of Clinical Endocrinology and Metabolism 1997; 82: 3913-3918.

23. Davignon J. Beneficial cardiovascular pleiotropic effects of statins, Circulation 2004; 109: 39-43. Doi:10.1161/01.CIR.0000131517.20177.5a

24. Lee VW, Ho IC, Chan WS, Tam KY, Lee KK. Statin utilization patterns for the primary prevention of cardiovascular events: a retrospective study in patients with diabetes mellitus in Hongkong, Am J Cardiovasc Drugs. 2008; 8:199-205. Doi: 10.2165/00129784-200808030-00006.

25. Roy A, Rawal I, Jabbour S, Prabhakaran D. Tobacco and Cardiovascular Disease: A Summary of Evidence. In: Cardiovascular, Respiratory, and Related Disorders. 3rd ed. Prabhakaran D, Anand S, Gaziano TA, Mbanya JC, Wu Y, Nugent R., Eds. The World Bank, Washington DC, 2017; 57-79.

26. Hinesa LM, Rimmb EB. Moderate alcohol consumption and coronary heart disease: a review, Postgrad Med J 2001;77:747–752.

27. Levine JA. Non-Exercise activity thermogenesis, Best Pract Res Clin Endocrinol Metab. 2002;16: 679-702. Doi: 10.1053/beem.2002.0227

28. Tanasescu M, Leitzmann MF, Rimm EB, Hu FB. Physical activity in relation to cardiovascular disease and total mortality among men with type 2 diabetes, Circulation 2003; 107:2435-2439. Doi: 10.1161/01.CIR.0000066906.11109.1F

29. Misra A. Ethnic-Specific Criteria for Classification of Body Mass Index: A Perspective for Asian Indians and American Diabetes Association Position Statement, Diabetes Technol Ther. 2015; 17: 667–671.

30. Boffetta P, McLerran D, Chen Y, Inoue M, Sinha R, He Jiang et al. Body Mass Index and Diabetes in Asia: A Cross-Sectional Pooled Analysis of 900,000 Individuals in the Asia Cohort Consortium, PLoS ONE 2011;6: e19930. Doi: 10.1371/journal.pone.0019930

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