COMPARING CORONARY ANGIOGRAPHIC FINDINGS AMONG DIABETIC AND NON-DIABETIC PATIENTS

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ABSTRACT

Background

Diabetes mellitus is worldwide metabolic and vascular problem characterized by hyperglycemia. People with diabetes have a 4-fold-greater risk of having a cardiovascular disease than people without diabetes.

Objectives

To look at the effect of diabetes mellitus on the number of the coronary vessels involved and the extent of coronary artery disease and the association of different socio-demographic characteristics in respect to diabetic and non-diabetic patients.

Patients and Methods

A cross-sectional observational study was conducted on two hundred patients who were admitted to Sulaimani Cardiac Teaching Hospital between March and September 2018. Half of the cases were diabetic and the other half were non-diabetic.

Results

Among the total of 200 patients involved in the study, 59% were males and 41% were females. Mean age was 60.98±10.60. Average HbA1c% value for DM patients was 8.46±2.10. Coronary angiography results in diabetic patients were positive for more multi vessel disease than non-diabetic patients (53% vs. 39%) (p value = 0.005). Diabetic patients were more likely to be hypertensive than non-diabetic patients (59% vs. 40%) (p value=0.001).

Conclusion

Diabetes mellitus is a risk factor for coronary artery disease and diabetic patients had more extensive CAD, which is comparable to other studies done in different countries

Keywords: *Coronary angiography, Diabetes mellitus, Coronary artery disease.*

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INTRODUCTION

Diabetes mellitus is worldwide metabolic and vascular problem characterized by hyperglycemia[1]. People with diabetes have a 4-fold-greater risk for having a cardiovascular disease than people without diabetes after controlling for traditional risk factors for CVD, such as age, obesity, tobacco use, dyslipidemia, and hypertension.

People with diabetes also have a 5-fold-greater risk for a first myocardial infarction (MI) and a 2-fold-greater risk for a recurrent MI than people who previously had an MI but do not have diabetes. Generally, the injurious effects of hyperglycemia are separated into macrovascular complications (coronary artery disease, peripheral arterial disease, and stroke) and microvascular complications (diabetic nephropathy, neuropathy, and retinopathy).Chronic hyperglycemia plays a major role in the initiation of diabetic vascular complications through many metabolic and structural derangements, including the production of advanced glycation end products (AGE), abnormal activation of signaling cascades, elevated production of reactive oxygen species (ROS, oxygen-containing molecules that can interact with other biomolecules and result in damage), and abnormal stimulation of hemodynamic regulation systems (such as the renin-angiotensin system [RAS]). The pathogenesis of macrovascular disease in diabetes is multifactorial; however, the common recipient of injury is the vascular endothelium. Diabetes initially impairs the ability of the vascular endothelium to vasodilate through inhibition of the nitric oxide [2].

Data recorded from Egypt, Kuwait, Bahrain, Iraq, Jordan and Qatar over the last five years show valuable indicators of mortality [3]. Coronary angiography is considered and remains the "gold-standard" technique for diagnosing and evaluating Coronary Artery Disease [4, 5].So this study was undertaken to find out how coronary vessel involvement in diabetic patients differs from that of non-diabetics.

PATIENTS AND METHOD

This study is a cross-sectional observational study. It was conducted between March through October 2018 in Sulaimani Cardiac Teaching Hospital. All the 200 patients signed a consent form. They were diagnosed as ischemic heart disease (chronic stable angina, non ST elevation myocardial infarction/unstable angina or ST elevation myocardial infarction).The patients were classified into two groups, one group who had Diabetes Mellitus (DM) (100) patients and another group without DM (100) patients. Detailed history was taken regarding risk factors including age, sex, diabetes mellitus, smoking history, family history of coronary artery disease, hypertension and Body Mass Index. Patients with mean blood pressure level higher than or equal to 130/80 mmHg or those reported taking antihypertensive medications were classified as hypertensive [6].

Diabetic patients had already been diagnosed as cases of DM and had been put on treatment. In addition to checking random blood glucose, they were sent for HbA1c level from the same lab to exclude lab error bias. All the patients were sent for Complete Blood Count, Electrocardiogram, lipid profiles and had their blood pressure checked.

Coronary angiography was done in all patients, by the same attending interventional cardiologist. Either radial or femoral access was used. The patients were observed after the intervention for any complications by the same team. The extent and severity of coronary artery disease were determined by the number of vessels involved and percentage of stenosis. Significant lesions were recorded if stenosis of left main stem (LMS) was more than 50% or more than 70% for other vessels[7].

In the presence of significant lesion at one vessel, it was considered as single vessel disease (SVD), if two vessels are involved, it was considered double vessel disease (DVD), and if there was significant stenosis involving all three vessels then it was termed triple vessel disease (TVD).

Severity of lesions was graded as in the following [8]:

Grade 1: Intimal disease <50% stenosis (non-significant)

Grade 2: 50-69% stenosis (intermediate)

Grade 3: 70-95% stenosis (critical)

Grade 4: 96-99% stenosis (sub-total)

Grade 5: Total occlusion.

Depending on these findings, a further treatment was planned that whether the patient requires medical management, percutaneous transluminal coronary angioplasty (PTCA), or coronary artery bypass grafting (CABG).

Statistical analysis was done using SPSS-22. The statistical significance of differences in patient groups was assessed by Chi-square test. Continuous variables were expressed as mean± SD. P value less than 0.05 was considered statistically significant.

RESULTS

Two hundred patients were included in the study randomly. One hundred and eighteen patients (59%) were males and eighty two patients (41%) were females. The age range was 31-85 years with the mean of 62.2±6.69 among diabetics and 59.41±13.089 among non-diabetics (p value = 0.195). Among diabetic patients 43 cases (43%) were male and 57 cases (57%) were females. Among non-diabetics 76 cases (76%) were males and 24 cases (24%) were females (p value = 0.0001).The BMI range of being overweight (25-29.9) was 53% among diabetics, while among non-diabetics was 46% (p value =0.844). Hypertension was more common among diabetics and female patients (79% and 52% respectively) compared to non-diabetics and males (54% and 48% respectively)(p value = 0.015 and 0.001 respectively). Smoking was more common among non-diabetics (70%) than diabetics (30%) (P value = 0.0013). (Table 1)

Diabetic patients had more DVD and TVD (55%) compared to non-diabetic patients (45%).While non-diabetic patients had more SVD than diabetics (53%) vs. (47%) (P value = 0.005). Both DVD and TVD were non-significantly more common among diabetic patients who used oral hypoglycemic agents (OHA) (19 and 10 cases respectively) than those who used insulin (4 and 1 cases respectively).Coronary angiography was normal in 9% of non-diabetic patients, while there wasn't any normal coronary angiography result among diabetic patients(0%)(p value 0.005) (Table 2)

Total LAD was more common among diabetics (18%) compared to non-diabetics (2%) (P value = 0.002). There was a statistically significant difference in LMS lesion for both critical and subtotal lesions among diabetics and non-diabetics (10% and 3% vs. 2% and 0% respectively) (p value=0.018) (Table 3).

Patients who were diabetic for more than 10 years had significantly more rate of TVD than those who were diabetic for less than 10 years(18 cases vs. 2 cases) , respectively.(p value= 0.008). Fifty percent of diabetic patients with HbA1c more than 8.5% had TVD, while 14% of those with HbA1c less than 8.5% had TVD (P value=0.013),(Table 4)

Table 1. Socio-demographic characteristics of the study group.

Variables		Diabetics	Non-diabeticsP	P value
Age(years)	< 45	0%	20(10%)	
	45-65	75(37.5%)	46(23%)	0.195
	≥ 66	25(12.5%)	34(17%)	
Gender	Male	43(21.5%)	76(38%)	0.001
	Female	57(28.5%)	24(12%)	
Hypertension	Yes	79(39.5%)	54(27%)	0.015
	No	21(10.5%)	46(23%)	
Smoking	Yes	16(8%)	40(20%)	0.0013
	No	84(42%)	60(30%)	
BMI	18.5-24.9	18(9%)	22(11%)	
	25-29.9	50(25%)	44(22%)	0.844
	≥ 30	32(16%)	34(17%)	

Table.2 Number of affected vessels in diabetic a nd non-diabetic patients

	Diabetics	Non-diabetics
Single vessel disease	47	52
Double vessel disease	32	23
Three vessel disease	21	16
Normal	0	9
Total	100	100

Table 3. Nature of vessel involvement.

	Diabetics	Non-diabetics	P value
LMS	17	4	0.018
LAD	74	63	0.002
LCX	29	27	0.149
RCA	61	46	0.138
Total	181	140	

Table 4. Duration of DM with number of affected vessels

	Less than 10 years	10 years and more	Total
SVD	24	23	47
DVD	12	21	33
TVD	2	18	20
Total	38	62	100

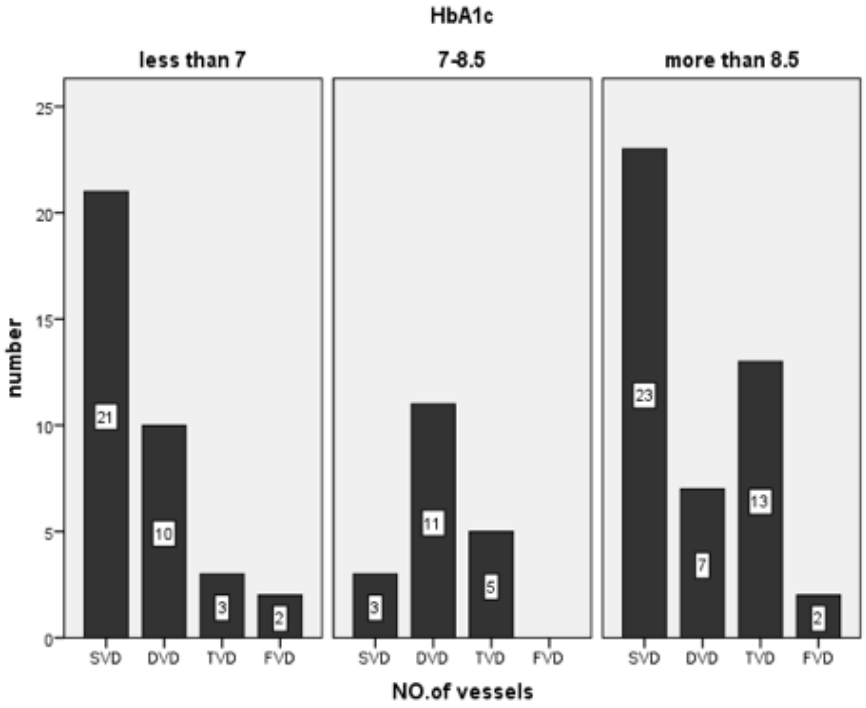

Figure 1. Relation between HbA1c and vessel severity

Table 5. Lesion severity of each coronary artery in diabetics and non-diabetics.

Coronary artery involvement	Diabetics	Non-diabetics	P value
LMS			
Normal	83	96	0.018
Critical	10	2	
Total	0	0	
Sub-total	3	0	
Intermediate	4	2	
LAD			
Normal	26	37	0.002
Critical	44	53	
Total	18	2	
Sub-total	8	4	
Intermediate	4	4	
RCA			
Normal	39	54	0.138
Critical	35	30	
Total	12	10	
Sub-total	8	2	
Intermediate	6	4	
LCX			
Normal	71	67	0.149
Critical	25	25	
Total	0	2	
Sub-total	4	2	
Intermediate	0	4	

DISCUSSION

The study showed that diabetic patients had non-significantly higher mean age than non-diabetic patients (p value = 0.195).The finding is similar to that reported in Milan-Italy between 2007 and 2008 [9] , Nepal between 2011 and 2013[10], and Baghdad in2009[11] which revealed no significant age variations. While other studies done in Erbil 2017[12], and the study of Shah et al [13] showed significant mean age difference. This can be due to the fact that some diabetic patients had undergone previous cardiac angiography at younger age (i.e. the angiography during this study was not their first one). In our study there were a higher percentage of females among diabetic patients than males. This finding is consistent with the results from the study done in Dhaka in January 2014[14] and the study of Muataz FH [15]. This suggests that women's natural protection from CHD is reduced in the presence of diabetes [16] Table 1.

In our study the association between smoking and lesion severity was not statistically significant (p value = 0.129). This result is consistent with other studies in Erbil [12] , Germany[17] and Netherland[18]. This may be explained by the extra caution of smokers than non-smokers towards their health with more frequent check-ups as they know smoking is a risk factor for CAD. The insignificant association with BMI in our study is similar to the results of Gaza-Palestine[19], India[20], Finland[21], and Erbil [12]. In contrary to the studies done in Nablus-Palestine [22], and Pisa-Italy [23] which showed a significant association (Table 1). The finding in our study can be explained by that obese patients have been shown to have a lower cardiac event rate compared with normal weight counterparts. This phenomenon has been termed the "obesity paradox."[24]

In our study those who had diabetes for more than 10 years were more likely to have DVD and TVD than those who had it for less than 10 years (p value = 0.04). This finding correlates with the study by Fox CS , Sultan L[25] and SRINIDHI[26].

In our study those who had HbA1c more than 8.5% had more TVD than those who had lower HbA1c. This is consistent with the result of the study by Tahir Saleem[27] and the SRINIDHI[26]."every 1% reduction in HbA1c decreases cardiovascular complication by 14%"[28].In contrary to the results of SRINIDHI[26] results which showed Hba1c more than 8.5% had higher number of DVD, our study showed statistically insignificant less DVD among those patients. This can be explained by the large difference of sample size between our study and SRINIDHI's study.

Our study revealed that diabetic patients had a higher rate of DVD and TVD and lower rate of SVD than non-diabetic patients (p value = 0.0005).This is consistent with the results from Silva [29] , Waller[30] and Afsar[31]. In another study conducted at Christian Medical College, Vellore [32] also showed that TVD was more common in diabetics (87.5% Vs 79.6%) in two separate groups of 516 diabetic and non-diabetic patients. Diabetic patients had lower frequency of SVD than non-diabetics, this is consistent with the results of the study by José Marconi [33] , but this is against the result of Tanjima Parvin [14] which showed higher percentage of SVD among diabetics than non-diabetics.

In our study, the commonest vessel involved in both diabetics and non-diabetics was LAD (74% VS 63%) respectively, followed by RCA and then LCX. This is in agreement with the results from Hoque [34] and Tanjima parvin[14]. This is against the results from the study Milan-Italy [9], Baghdad in 2009[11], and Netherland [18] which showed the LCX to be the commonest vessel involved.

In this study critical lesion was the commonest pattern of vessel involvement among both diabetic and non-diabetics. Total occlusion was more common among diabetics than non-diabetics (30 lesions vs. 14 lesions, respectively)(p value = 0.002).This is consistent with the results from Mossavi [35], Uddin [36], Nicholls [37], and Rana[38].

We recommend adopting a healthy life style, frequent HbA1c measurement and drug compliance, which have been proven to lower the cardiovascular complications and morbidity in diabetes patients

In conclusion, diabetic patients were more likely to be females rather than males. Diabetics had more DVD and TVD compared to non-diabetics. Critical lesion was the most common pattern of involvement among both diabetics and non-diabetics. LAD was the most commonly involved vessel among both diabetics and non-diabetics followed by RCA. Those patients who had diabetes mellitus for more than 10 years had a higher rate of TVD. HbA1c level had a direct effect on lesion severity and those who had HbA1c more than 8.5% had more chance of TVD.

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