

Coronary Angiographic Findings among Diabetic Patients In Basrah Cardiac Centre A Cross Sectional Study

Asaad Hassan Kata¹, Mustafa Y. AL-Sudani², Abbas A. Mansour³

ABSTRACT

Background: Diabetes mellitus is associated with the increased prevalence of atherosclerosis and coronary heart disease. Diabetes mellitus highly affects patients who have already experienced an unstable angina or myocardial infarction. Diabetes mellitus is also expected to increase in the coming decades among people worldwide.

Aim: This study aims at exploring comparatively the correlation between electrocardio-graphic and coronary angiographic findings in both diabetic and non-diabetic patients with ischemic heart disease (IHD), also to determine the severity and extent of coronary artery disease in diabetic compared to non-diabetic.

Methods: This was a cross sectional study, enrolled 100 patients from the Cardiac Catheterization Center in Al-Sadder Teaching Hospital, Basrah, Iraq during the period between January and May 2012. Fifty diabetic and 50 non-diabetic consecutive patients were selected. Every selected patient underwent an ECG and coronary angiography depending on at least one indication.

Results: A significant correlation was found between diabetes and ischemic angiographic findings and diabetic patients has more extensive and diffuse disease than non-diabetic.

Conclusions: Diabetic patients are more susceptible to ischemic heart disease than non-diabetic, Therefore diabetic patients with suspected CAD are highly recommended to have coronary angiography.

Keywords: coronary angiography, diabetes mellitus & ischaemic heart disease.

قسطرة الشرايين التاجية لمرضى السكري في مركز البصرة للقلب

المقدمة: يؤدي مرض السكري الى زيادة انتشار تصلب الشرايين ومرض القلب التاجي. كما انه يؤثر على المرضى المصابين بمرض الذبحة الصدرية الغير مستقرة او الجلطة القلبية. كما ويتوقع في العقود القادمة ان ينتشر مرض السكري بين الناس.

الاهداف: تهدف الدراسة الى اكتشاف العلاقة بين عملية القسطرة والتخطيط القلبي عن طريق مقارنة نتائج هاتين العمليتين والتي تم الحصول عليها من مجموعة مرضى القلب الافراري والمصابين بالسكر والغير مصابين بهذا المرض. لذا فقد اجريت هذه الدراسة لقياس وتحديد مدى وشدة الضرر في الشريان التاجي في المرضى المصابين بمرض السكري والغير مصابين بهذا المرض.

طريقة البحث في الدراسة الحالية تم اختيار 50 شخص مصاب بمرض السكري و 50 اخرين غير مصابين بهذا المرض بصورة عشوائية من وحدة قسطرة القلب في مستشفى الصدر التعليمي في البصرة/عراق. وقد شملت هذه الدراسة الفترة من كانون الثاني ولحد حزيران من سنة 2012. حيث تم اجراء عملية القسطرة لجميع المرضى الذين تم اختيارهم والمسجلين في المستشفى. علاوة على ذلك، فقد تم تصوير الاوعية التاجية لذات المرضى اعتمادا على مؤشر واحد على الاقل. ولقد قيست مدى شدة الضرر في الشرايين التاجية بوساطة اخصائيين من ذوي الخبرة في هذا المجال، والذين وقع على عاتقهم تقديم تقريرا عن عملية القسطرة للقلب.

نتائج الدراسة: هناك ارتباط كبير بين مرض السكري ومرض تصلب شريين القلب. الى جانب ذلك، ان قيمة P كانت >0.05، حيث كانت نسبة مرضى السكري المصابين بمرض تصلب الشرايين التاجية 86% (50/43) بينما كانت نسبته عند باقي المرضى غير المصابين بالسكر (56%) في حين أن النتيجة الغير طبيعية لعملية تخطيط القلب هي 2.0 و 5.0. حيث كانت نتيجة التخطيط موجهه عند 32/50 من مرضى السكري بينما كانت موجهه عند باقي المرضى في 18/50.

¹Cardiologist, Alsader Teaching Hospital

²MBChB.

³FRCP(Edin) Professor of Medicine, Department of Medicine, College of Medicine, University of Basrah, Iraq.

الاستنتاجات : ان مرضى السكري هم أكثر عرضة لأمراض القلب الإقفارية من الاشخاص الغير مصابين بهذا المرض. الى جانب ذلك، ان شدة مرض الشريان التاجي هي أيضا أعلى في الاشخاص المصابين بمرض السكري من الاشخاص الغير مصابين بهذا المرض في مدينة البصرة.
المفردات الرئيسية: قسطرة القلب، مرض السكري قصور الشرايين التاجيه.

INTRODUCTION

Diabetes Mellitus

Diabetes mellitus represents a chronic disease that approximately inflicts 150 million people worldwide.^[1] It is expected to increase in the coming decades among people.^[2] It is stated that diabetic people are at risk of having atherosclerosis and Coronary Artery Disease (CAD). DM is the leading cause of death in the world and is associated with a 2- to 8-fold higher morbidity and mortality from cardiovascular disease. Remarkably, 65% to 75% of patients with DM die of cardiovascular disease.^[3,4] In the present study, the respondents were classified according to their medical reports into two groups: diabetic and non-diabetic. A patient was considered diabetic if he/she was taking insulin or oral hypoglycemic agents, or met the criteria of the National Diabetes Data Group and WHO criteria for diagnosing DM. These criteria includes following:

- **FBS > 7.0 mmol/L (126 mg/dL);**
- **Symptom of DM plus RBS > 11.1 mmol/L (200 mg /dL); or**

- **Two – hour plasma glucose > 11.1 mmol/L (200 mg/dL) during an OGGT.^[5]**

Coronary Angiography

Coronary Angiogram (CA) should be considered a diagnostic test used in combination with complementary noninvasive tests. Identification of CAD and assessment of its extent and severity are the most common indications for cardiac catheterization in adults, coronary arteriography provides the most reliable anatomic information for determining the appropriateness of medical therapy, percutaneous coronary intervention (PCI), or coronary artery bypass surgery (CABG) and subsequently become one of the most widely used invasive procedures in cardiovascular medicine^[6] The American College of Cardiology and the American Diabetes Association Consensus Development Conference has established guidelines for screening diabetic individuals for CAD. For more illustration for the guidelines, consider (Table-1).

Table 1. Indications for CAD Testing in Diabetic Patients^[7]

Patients can be screened for CHD if they suffer from:	
1.	Typical or atypical cardiac symptoms
2.	Resting electrocardiograph suggestive of ischemia or infarction
3.	Peripheral or carotid occlusive arterial disease
4.	Sedentary lifestyle, age ≥35 years, and plans to begin a vigorous exercise program
5.	Two or more of the risk factors listed below in addition to diabetes: a) <i>Total cholesterol ≥240 mg/dl (6.2 mmol/l), LDL cholesterol ≥160 mg/dl (4.2 mmol/l), or HDL cholesterol <35 mg/dl (0.9 mmol/l);</i> b) <i>Blood pressure >140/90 mm Hg;</i> c) <i>Smoking; or</i> d) <i>Family history of premature CHD</i>

The American Heart Association defined high blood pressure as systolic pressure ≥ 140 mm Hg or diastolic pressure ≥ 90 mm Hg, or if someone uses antihypertensive medication, or being told at least twice by a physician or other health professional that he/she has hypertension.^[8]

Aim of Study: this study aims at exploring comparatively the correlation between electrocardio-graphic and coronary angiographic findings in both diabetic and non-diabetic patients with ischemic heart disease (IHD), also to determine the severity and extent of coronary artery disease in diabetic compared to non-diabetic.

METHOD OF THE STUDY

A cross sectional study enrolled 100 patients from Cardiac Catheterization Center in Al-Sadder Teaching Hospital, Basrah, Iraq, during the period between January and May 2012. Fifty diabetic and 50 non-diabetic consecutive patients were selected. The data were analyzed in October 2012. Every selected patient underwent an ECG and coronary angiography depending on at least one indication in addition to full history and clinical examinations. The first group, the diabetic, it includes 33 males and 17 females. As for the non-diabetic group, it consists of 39 males and 11 females. Electrocardiographic (ECG) was done for all patients and the electrocardiogram (ECG) is a mainstay in the initial diagnosis of patients with suspected ACS. It allows initial categorization of the patient with a suspected MI into one of three groups based on the pattern: ST elevation MI (ST elevation or new left bundle branch block) non-ST elevation ACS, with either NSTEMI or UA (ST-depression, T-wave inversions, or transient ST-elevation) Undifferentiated chest pain syndrome (non-diagnostic ECG).

ST Elevation Myocardial Infarction: ECG criteria for the diagnosis of ST elevation MI, which include 2 mm of ST segment elevation on

the precordial leads for men and 1.5 mm for women (who tend to have less ST elevation) and greater than 1mm in other leads.^[9]

Non-ST elevation ACS: A non-ST elevation ACS is manifested by ST depressions and/or T wave inversions without ST segment elevations or pathologic Q waves.

The classification of CAD was done in according to the American Heart Association, were the patient considered to have a significant lesion in the coronary arteries if the lesion was >70 and more except for the Left Main Stem (LMS), which was considered significant if its lesion is 50% or more. The patient underwent coronary angiography based on the indication mentioned in (Table-1). Family history of premature CAD (male first degree relative < 55 years and female first degree relative < 65 years).

Statistical Analysis

Statistically speaking, the data has been analyzed using the SPSS version 17 for windows Software. The results of all quantitative data were expressed as mean \pm SD. Pearson's Chi square tests were used for assessing qualitatively the correspondence between CAD in diabetic and non-diabetics groups.

RESULTS

The mean age in both diabetic and non-diabetic groups was almost equal (57.9 ± 9.8 and 59.6 ± 9.7 , respectively). Risk factors were reported in 41(82%) patients in the diabetic group, compared to only 34 (68%) in the non-diabetic group, (Table-2). Electrocardiographic findings were abnormal in 32 (64%) in the diabetic group, versus 18 (36%) in the non-diabetic group. The P value was 0.2 for diabetic, which is insignificant. The abnormal angiographic findings were 43 (86%) in diabetic and 28(56%) in the non-diabetic which was a strong statistical correspondence between diabetes and the abnormal angiography findings, the cornerstone of the study (Table-2).

Table 2. Clinical Characteristic of Diabetics and Non-Diabetic Patients.

Variables		Diabetics (n=50)	Non-Diabetics (n=50)	P=values
Gender	Male	33	39	N.S.
	Female	17	11	N.S.
Mean of ages SD mean ±SD(yr)		57.9±9.8	59.6±9.7	0.004
Duration of DM mean ±SD(yr)		9.8±7.8		N.S.
Risk Factors		41 (82%)	34 (68%)	N.S.
Hypertension		40 (80%)	29 (58%)	N.S.
Family History of IHD		19	16	N.S.
Smoking	Active	14	10	N.S.
	Passive	36	40	N.S.
Abnormal ECG Finding		32	18	0.02
Abnormal Angiographical Findings		44	28	< 0.0001
Type of treatment	Insulin	13		
	OAD	37		

(Table-3), showed that 7 patients (14%) had no vessel affected in the diabetic group whereas 22 patients (44%) were in the non-diabetic .Single vessel was found in 6 (12%) and 12 (24%) in the diabetic and non-diabetic group,

respectively with a P-value less than 0.001. Furthermore, two- and three-vessel disease were found in 11 (22%) and 26 (52%) of the diabetic group, compared to 6 (12%) and 10 (20%) of the non-diabetic group, respectively

Table 3. Types of Coronary Artery Disease in Diabetic and Non-Diabetic Patients

Types of Lesion	Diabetes		Non Diabetes		P- value
	No.	%	No.	%	
No Significant Lesion	7	14	22	44	< 0.001
Single Vessel Disease	6	12	12	24	< 0.001
Two Vessel Disease	11	22	6	12	< 0.001
Three Vessel Disease	26	52	10	20	< 0.001
Total	50	100.0	50	100.0	

Nine (18%) in the diabetic group showed a lesion in the left main stem whereas only 3 (6%) showed a similar lesion in the non-diabetic (P value was less than 0.001), (Table-4).

Table 4. The Measured Culprit Coronary Artery of the Studied Groups

Coronary Artery	Diabetes (n=50)		Non-Diabetes (n=50)		P-Values
	No.	%	No.	%	
LMS	9	18	3	6	< 0.001
LAD	37	74	21	42	< 0.001
CX	22	44	14	18	< 0.001
RCA	35	70	14	28	< 0.001

(Table-5), shows the correlation of the result of coronary angiography with the ECG findings, out of 43 patients with significant coronary

artery lesions, 29 had abnormal ECG finding and the remaining 14 patients had no ECG changes.

Table 5. Correlation of Coronary Angiography and ECG.

ECG	Coronary Angiography		Total
	Positive	Negative	
Positive	29	3	32
Negative	14	4	18
Total	43	7	50

Sensitivity = 67.44 %

specificity = 57.14%

DISCUSSION

This study revealed that the abnormal angiographic lesions were significantly greater in the diabetic patients than in non-diabetic. Furthermore, the main finding of this study was that diabetic patients had a more severe and an extensive CAD than the non-diabetic one. The abnormal angiographic findings in DM were 43 in diabetic and 28 in non-diabetic which is highly significant. This proved that there was a significant correlation between diabetes and abnormal coronary angiographic finding.^[10,11] (Table-3), showed single vessel disease in our study, was higher in the non-diabetic group, than in the diabetic patients. It was further noticed that double & triple vessel diseases were highly prevalent among diabetes patients. This confirms the fact that diabetic patients have extensive coronary artery disease, a finding that is compatible with those obtained by the previous larger multicenter studies.^[12] Similar result reached by Natali et al,^[13] where diabetic patients had more frequently three vessel disease and less frequently the single-vessel disease. Additionally, risk factors in our study (hypertension, family history of IHD, smoking, gender and age) had no difference in 2 groups who have an abnormal angiographic finding. Such a result is not in line with the one obtained by previous studies which maintained that hypertension was more common in diabetic patients.^[14] Krishnaswami and colleagues^[15] studied the coronary arterial lesions seen by angiography in 1666 consecutive male patients, it was found that there were significant relations between CAD severity and diabetes, and this is

with agreement with other results. In comparison with coronary angiography, our study showed that the sensitivity of ECG for detection of ischaemic heart disease was high (67.44%) whereas the specificity was 57.14 this reflects the fact that the ECG changes in diabetic may be caused by factors other than ischaemic heart disease like the associated hypertension or diabetic autonomic neuropathy.^[16-18]

CONCLUSIONS AND RECOMMENDATIONS

People with diabetes have an increased prevalence of atherosclerosis and coronary artery disease (CAD). Further, the incidence of having an extensive and diffuse disease is more common in patients with diabetes. Therefore diabetic patients with suspected CAD are highly recommended to have coronary angiography. The latter provides the clinician with valuable information regarding the confirmation of the presence or absence of coronary artery disease, the prognosis of patients with CAD and the determination between following a drug therapy, coronary stenting or surgical bypass graft.

REFERENCES

1. Irina K, Jolantap, Hanna B, Beata T. et al. Disturbances of Glucose Metabolism in Men Referred for Coronary Arteriography: Diabetic Care. 2001; 24: 897-901.3.
2. Nesto RW. Diabetes and Heart Disease. In: Zipes D. P., Libby P., Bonow R.O., Braunwald E., (eds.). Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine 7th edition, USA, Elsevier-Saunders, 2005: pp.1355
3. Libby P, Nathan DM, Abraham K, Brunzell JD, Fradkin JE, Haffner SM, et al. Report of the National Heart, Lung, and Blood Institute-National Institute of Diabetes and Digestive and Kidney Diseases Working Group on Cardiovascular Complications of Type I Diabetes Mellitus. Circulation. 2005; 111: 3489-3493.
4. Norhammar A, Malmberg K, Diderholm E, et al. Diabetes Mellitus: The Major Risk Factor in Unstable Coronary Artery Disease Even after Consideration of the Extent of Coronary Artery

- Disease and Benefits of Revascularization. *J. Am CollCardiol* 2004; 43:585-91.
5. Hanlon P, Byers M, Walker B, Summerton C. Environmental and nutritional factor in disease. Nicholas A. Nicki R. Brian R. Davidsons principle and practice of medicine. 20th ed. London. Churichil Livingstone. 2006; p 93-113.
 6. Brusckhe AV, Sheldon WC, Shirey EK, et al. A half century of selective coronary arteiography. *J Am Coll Cardiol* 54:2139:2009.
 7. American Diabetes Association. Consensus Development Conference on the Diagnosis of Coronary Heart Disease in People with Diabetes (Consensus Statement). *Diabetes Care* 1998; 21:1551-1559.
 8. Donald Lloyd-Jones; Robert Adams, et al; Heart disease and stroke statistics - 2009 update; a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee, *Circulation*. 2009; 119:e21-e181
 9. Thygesen K, Alpert JS, White H D, Jaffe A S, Apple FS, Galvani M, et al. Universal definition of myocardial infarction. *Eur Heart J*. 2007; 28:2525
 10. Vigorito C, Betocchi S, Bonzani G, et al. Severity of Coronary Artery Disease in Patients with Diabetes Mellitus. Angiographic Study of 34 Diabetic and 120 Non-Diabetic Patients. *Am Heart J*. 1980;100:782-7.
 11. Giri S, Shaw L.J, Murthy DR, et al. Impact of Diabetes on the Risk Stratification Using Stress Single-Photon Emission Computed Tomography Myocardial Perfusion Imaging in Patients with Symptoms Suggestive of Coronary Artery Disease. *Circulation* 2002; (1051): 32-40.
 12. Preis SR, Hwang SJ, Coady S, et al. [Trends in all-cause and cardiovascular disease mortality among women and men with and without diabetes mellitus in the Framingham Heart Study, 1950 to 2005.](#) *Circulation* 2009; 119:1728.
 13. Sarwar N, Gao P, Seshasai SR, Gobin R, Kaptoge S, Di Angelantonio E, Ingelsson E, Lawlor DA, Selvin E, Stampfer M, Stehouwer CD, Lewington S, Pennells L, Thompson A, Sattar N, White IR, Ray KK, Danesh J (2010). ["Diabetes mellitus, fasting blood glucose concentration, and risk of vascular disease: A collaborative meta-analysis of 102 prospective studies"](#). *The Lancet* 375 (9733): 2215-22. doi:10.1016/S0140-6736(10)60484-9. [PMC 2904878](#). [PMID 20609967](#)
 14. Natali A, Vichi S, Landi P, Severi S, L'abbate A, Ferrannini E. Coronary Atherosclerosis in Type II Diabetes: Angiographic Findings and Clinical Outcome. *Diabetologia* 2000; 43: 632-41.47.
 15. Yasue H, Hirai N, MizunoY, et al. Low-grade inflammation, thrombogenicity, and atherogenic lipid profile in cigarette smokers. *Circ J*, 2006; 70:8-13.
 16. Krishnaswami S, Joseph G, Punnoose E, Chandy ST. Coronary Angiographic Findings in Patients with Diabetes: An Exercise in Cardiovascular Epidemiology. *J. Assoc. Physicians India* 1996; 44 (3): 169-171.
 17. Nelson MB, Daniel KR, Freedman BI, Prineas RJ, Bowden DW, Herrington DM. Associations between electrocardiographic interval durations and coronary artery calcium scores: the Diabetes Heart Study. *Pacing Clin Electrophysiol*. 2008; 31: 314-321.
 18. Okin PM, Devereux RB, Lee ET, Galloway JM, Howard BV. Electrocardiographic repolarization complexity and abnormality predict all-cause and cardiovascular mortality in diabetes: the Strong Heart Study. *Diabetes*. 2004; 53: 434-440.