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*Original Article*

# Comparison of Coronary Diseases by Coronary Angiography between Diabetic and Non-Diabetic Patients

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***Abstract*** *- Cardiac adversity is by far the commonest cause of mortality in patients with diabetes.to study angiographic extents, number of coronary vessels, and type of lesions(A, B, C)and comparison the findings between diabetic and non-diabetic patients. The study included all Syrian patients who underwent a cardiac catheterization from 8 March to 8 September 2022 at Tishreen University Hospital in Latakia. It included 455 patients; 181 of them were excluded(either normal coronary arteries or the fact that the patient had previously performed a Coronary Artery Bypass Graft). Results of this comparative study: Diabetic patients had more affected arteries(3arteries:39.6% in diabetic patients and 6.7%in non-diabetic patients, two arteries:35.3% in diabetic patients and 11.9% in non-diabetic patients, 4 arteries(including left main):5.8 % diabetic patients and 1.5% non-diabetic patients, single artery:16.5%in diabetic patients and 76.3% in non-diabetic patients. The anterior descending artery is the most affected artery, with 87.8% of the left circumflex artery and 69.8% of diabetic patients. Type of lesion: Type A:7.9%in diabetic and 47.4% in non-diabetic patients, type B:57.6%in diabetic and 38.5 %in non-diabetic patients.Type C:33.8%in diabetic and 10.4%in non-diabetic patients.*

***Keywords*** *- Diabetic, Coronary Angiography, Type of lesion(A, B, C).*

## 1. Introduction

Diabetes is a disease with complications, both acute and chronic. Cardiac affliction is by far the commonest cause of mortality in patients with diabetes [1]. Dyslipidemia is observed in practically all patients of type-2 diabetes mellitus, and every high cholesterol level in people with diabetes has 2-3 times higher CAD risk than non-diabetic individuals. Cardiac involvement in diabetes commonly manifests as coronary artery disease (CAD)and less commonly as diabetic cardiomyopathy and cardiac autonomic neuropathy.[2] Diabetes mellitus (DM) is one of the most important risk factors for developing coronary artery disease (CAD), recently considered a CAD risk equivalent. CAD alone accounts for the major chunk of mortality in diabetes. Accelerated and greater frequency of CAD has been widely documented in hospitals, autopsy, and epidemiological as well as longitudinal studies in several populations. Diabetes mellitus is one of the most common diseases worldwide, ranking next to cardiovascular disorder. It is estimated that around 100 million populations are affected by diabetes worldwide [3]. Patients with DM have increased mortality after MI and a worse overall long-term prognosis with CAD.[4][5]. Diabetic patients exhibit an increased risk of developing atherosclerotic CAD for many reasons, including metabolic factors like hyperglycaemia, dyslipidemia and insulin resistance, which lead to endothelial cell and vascular smooth muscle dysfunction.[6],[7].

Impaired platelet function and abnormal coagulation.[8]. Diabetic patients tend to exhibit other risk factors for CAD, like hypertension and obesity. Patients with diabetes have lipid-rich atherosclerotic plaques, which are more vulnerable to rupture than the plaques seen in non-diabetic patients.[9],[10]. Yoo et al. described an overall increase in atherosclerotic burden and a 3.5-fold higher risk of coronary stenosis independent of other cardiovascular risk factors in diabetic patients.[11].

Inflammation plays an important role in atherosclerosis. Inflammation activation in type 2 DM results from obesity and insulin resistance, in which an acute phase reaction occurs, and many inflammatory and pro-inflammatory cytokines are released from adipose tissue.[12]. Endothelial dysfunction is generally present in diabetic patients with CAD, as evidenced by high levels of endothelin 1 and low levels of nitric oxide.[13].Vascular endothelial (VE)-cadherin was identified recently as an updated marker of endothelial function that is well-correlated with endothelin 1 in diabetic patients with CAD.[14].

Enhanced thrombus formation occurs in type 2 DM because of increased platelet activity and blood coagulability.[15]. Pathological alterations in fibrinogen and plasminogen activation inhibitors are primarily relevant for the short-term incidence of cardiovascular events in patients with type 2 DM.[29].

Notably, not all diabetic patients develop cardiovascular disease despite the presence of the same risk factors. However, recent studies focused on biomarkers of CVD in diabetic patients, such as serum phospholipids and their role in the progression of CVD. Beatriz García-Fontana and colleagues recently found low serum levels of 4 phospholipids in diabetic patients with CVD compared to diabetic patients without CVD.[17]

A recent study found a new biomarker in type 2 DM complicated with CAD significantly elevated and positively correlated with the degree of CAD stenosis. This new biomarker is called Osteonectin Secreted Protein Acidic and Rich in Cysteine (SPARC). The mechanism by which SPARC may cause CAD development requires further research.[18]

Palazhy et al. evaluated oxidative stress in CAD patients on statins in a cross-sectional study of 3 groups: Group 1, healthy control; Group 2, patients with DM and CAD on statins; Group 3, only diabetic patients. They found that oxidative stress was higher in the CAD and DM groups despite statin therapy. These results highlighted the importance of oxidative stress.[19]

## 2. Patients and Methods

This is a prospective comparison study (cross-sectional study). This study includes all patients who underwent cardiac catheterization at Tishreen University Hospital in Latakia, Syria. From 8th March to 8th September 2022, their number was 455. The study included 274 patients according to the exclusion and inclusion criteria. We divided this sample into two parts: a group of patients with diabetes(139 patients or 50.7%) and a group without diabetes(135 patients or 49.3%).
Inclusion criteria:

All patients underwent cardiac catheterization at tishreen university hospital in Latakia, Syria, from 8th March to 8th September 2022 after observing exclusion criteria.

### *2.1. Exclusion Criteria*

- Patients with normal coronary arteries (stenosis less than 70% and less than 50% of the left main).
- Patients who have previously undergone Coronary Artery, Bypass Graft.

The patient's clinical history was documented, including age, gender and the presence of risk factors such as hypertension, hyperlipidemia, smoking, and familial history. They were classified according to the clinical condition that led them to the catheterization laboratory (Acute Coronary Syndrome, Syncope, heart failure, stable angina, diagnostic before valve surgery, and others). We studied the number of affected coronary arteries, the distribution of the lesion within the coronal tree, and the severity of the lesion (A, B, C) according to the definition by the American heart association. Then we classified the location of the lesion from the affected artery by denoting it with numbers and letters as approved by the syntax diagram.

### *2.2. Statistical Analysis*

Study design: a prospective comparative study (cross-sectional). Statistical analysis was done using IBM SPSS statistics (version 20). Descriptive statistics included measures of central tendency and measures of dispersion for quantitative variables and frequencies and percentages for qualitative variables. The following tests were used: an Independent T-student test to study the difference between the averages of two independent groups—a chi-square test to study the relationship between qualitative variables. The results were considered statistically significant with a p-value of $< 5\%$.

## 3. Results

With regard to the clinical manifestation that led the patient to perform cardiac catheterization, acute coronary syndrome was the most common cause in both groups, with its control among non-diabetics. No non-diabetic patient with heart failure was reviewed, while cardiac catheterization was performed for 15 diabetic patients (10.8 % of the diabetic patient's group) whose clinical manifestation was heart failure. Table 1, with regard to the number of affected arteries, we found that the injury of only one artery was higher among non-diabetics. With the increased number of affected arteries, we find that the percentage is more dominant among diabetic patients. Table 2 with regard to the lesion type, type A was more common in non-diabetics, while types B and C were more common in diabetics, with a clear dominance of type B (57.6% of people with diabetes). Table 4 with regard to the site of the lesion, the injury to the left main and the first segment of the anterior descending was more common among people with diabetes, as well as the rest of the parts of the anterior descending and the diagonal arteries were more frequent among people with diabetes. Tables 5 and 6 about the lesion site in the circumflex artery, our study showed an increased incidence of proximal and distal segment injury as well as the first marginal in people with diabetes. Moreover, the highest percentage was for the distal segment. Table 7 concerning right coronary injury, the lesion incidence was higher among people with diabetes as well, with clear control of the increase in the incidence of second segment injury. Table 8

**Table 1. Shows the clinical cases that led patients to perform a cardiac catheterization, which was classified as diabetic and non-diabetic**

| Clinical manifestation | Diabetic patients | Non-diabetic patients | P-value |
|---|---|---|---|
| **STEMI** | 20(14.4%) | 46(34.1%) | 0.0001 |
| **N.STEMI** | 18(12.9%) | 7(5.2%) | 0.02 |
| **Unstable Angina** | 63(45.3%) | 65(48.1%) | 0.6 |
| **Stable Angina** | 14(10.1%) | 10(7.4%) | 0.4 |
| **Heart failure** | 15(10.8%) | 0(0%) | 0.0001 |
| **Diagnostic presurgery** | 5(3.6%) | 3(2.2%) | 0.4 |
| **Syncope** | 1(0.7%) | 1(0.7%) | 0.9 |
| **Others** | 3(2.2%) | 2(1.5%) | 0.6 |

**Table 2. Shows the number of affected arteries in patients who underwent cardiac catheterization and who were classified as diabetic and non-diabetic patients**

| Number of affected arteries | Diabetic patients | Non-diabetic patients | P-value |
|---|---|---|---|
| **Single artery** | 23(16.5%) | 103(76.3%) | 0.0001 |
| **Two arteries** | 49(35.3%) | 16(11.9%) | 0.0001 |
| **Three arteries** | 55(39.6%) | 9(6.7%) | 0.0001 |
| **Four arteries** | 8(5.8%) | 2(1.5%) | 0.04 |

**Table 3. Shows the distribution of injury among patients who underwent cardiac catheterization and who were classified as diabetic or non-diabetic patients**

| Lesion site | Diabetic patients | Non-diabetic patients | P-value |
|---|---|---|---|
| **Left main** | 14(10.1%) | 5(3.7%) | 0.03 |
| **Left anterior descending artery** | 122(87.8%) | 84(62.2%) | 0.0001 |
| **Circumflex artery** | 97(69.8%) | 32(23.7%) | 0.0001 |
| **Right coronary artery** | 93(66.9%) | 47(34.8%) | 0.0001 |

**Table 4. Showing lesion type in patients who underwent cardiac catheterization who were classified as diabetic and non-diabetic**

| Lesion type | Diabetic patients | Non-diabetic patients | P-value |
|---|---|---|---|
| **A** | 11(7.9%) | 64(47.4%) | 0.0001 |
| **B** | 80(57.6%) | 52(38.5%) | 0.002 |
| **C** | 47(33.8%) | 14(10.4%) | 0.0001 |

**Table 5. Showing the location of the lesion in patients who underwent cardiac catheterization, indicated by numbers and letters as supported by the syntax diagram in the left main**

| Left main | Diabetic patients | Non-diabetic patients | P-value |
|---|---|---|---|
| **5** | 13(9.4%) | 5(3.7%) | 0.04 |

**Table 6. Shows the location of the lesion in patients who underwent cardiac catheterization, indicated by numbers and letters as supported by the syntax diagram in the left anterior descending artery**

| Left anterior descending artery | Diabetic patients | Non-diabetic patients | P-value |
|---|---|---|---|
| **6** | 56(40.3%) | 26(19.3%) | 0.0001 |
| **7** | 97(69.8%) | 65(48.1%) | 0.0001 |
| **8** | 41(29.5%) | 13(9.6%) | 0.0001 |
| **9** | 54(38.8%) | 15(11.1%) | 0.0001 |
| **9a** | 41(29.5%) | 7(5.2%) | 0.0001 |
| **10** | 14(10.1%) | 6(4.4%) | 0.07 |
| **10a** | 13(9.4%) | 6(4.4%) | 0.1 |

**Table 7. Shows the location of the lesion in patients who underwent cardiac catheterization, indicated by numbers and letters as supported by the syntax diagram in the circumflex artery**

| Circumflex artery | Diabetic patients | Non-diabetic patients | P-value |
|---|---|---|---|
| **11** | 38(27.3%) | 10(7.4%) | 0.0001 |
| **12** | 11(7.9%) | 4(3%) | 0.07 |
| **12a** | 47(33.8%) | 9(6.7%) | 0.0001 |
| **12b** | 26(18.7%) | 8(5.9%) | 0.001 |
| **13** | 54(38.8%) | 19(14.1%) | 0.0001 |
| **14** | 19(13.7%) | 6(4.4%) | 0.008 |
| **14a** | 10(7.2%) | 5(3.7%) | 0.2 |
| **14b** | 6(4.3%) | 3(2.2%) | 0.3 |
| **15** | 4(2.9%) | 1(0.7%) | 0.1 |

**Table 8. Shows the location of the lesion in patients who underwent cardiac catheterization, indicated by numbers and letters as supported by the syntax diagram in the right coronary artery**

| Right coronary artery | Diabetic patients | Non-diabetic patients | P-value |
|---|---|---|---|
| **1** | 32(23%) | 13(9.6%) | 0.003 |
| **2** | 67(48.2%) | 36(26.7%) | 0.0001 |
| **3** | 43(30.9%) | 24(17.8%) | 0.01 |
| **4** | 43(30.9%) | 24(17.8%) | 0.01 |
| **16** | 7(5%) | 5(3.7%) | 0.5 |
| **16a** | 4(2.9%) | 3(2.2%) | 0.7 |
| **16b** | 1(0.7%) | 2(1.5%) | 0.5 |
| **16c** | 1(0.7%) | 2(1.5%) | 0.5 |

## 4. Discussion

Hyperglycemia represents the main initiating factor in the pathogenesis of diabetic complications.[20] A causal relationship between levels of hyperglycemia and diabetic microvascular and macrovascular complications was found in both T1DM and T2DM patients.[21]. Intensive diabetes therapy and lower levels of HbA1c in T1DM are associated with thinner carotid IMT, less coronary calcification and a lower incidence of clinical cardiovascular events, such as myocardial infarction, stroke and cardiac death[22]. In T2DM patients, metabolic control (HbA1c < 7%) reduces the risk of coronary heart disease death and all coronary heart disease events[23].

Our current study included 274 patients, including 139 diabetics and 135 non-diabetics. We compared the findings of coronary angiography. Our study showed that the number of affected arteries in diabetics is more, and the severity of the injury is more, especially in type B of severity. We compared the results of our study on Syrian patients with similar, previously published international studies. Our findings on injury severity and extent are in agreement with other studies [24], [25], [26], [27]. About the most affected artery, our study agreed with other studies that the left anterior descending artery is the most affected in the two groups [28], followed by the circumflex, then the right coronary artery in diabetics, and the right coronary, then the circumflex in non-diabetics, according to Tables 7 and 8, in contrast to other studies that showed that the circumflex artery then the right coronary after the anterior descending both groups have [28].

## 5. Conclusion

The number of affected coronary arteries in people with diabetes is greater than the number in non-diabetics, and the severity of the injury is greater in people with diabetes. The most common artery affected is the left anterior descending artery in both groups, followed by the circumflex and then the right coronary in people with diabetes. As for non-diabetics, the injury to the right coronary comes second after the anterior descending artery, then the circumflex artery.

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