

# Comparing the Severity of Coronary Artery Stenosis in Diabetic and Nondiabetic Patients

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**Background:** Diabetes is a common disease. There are some reports that indicate higher prevalence of coronary artery disease (CAD) in diabetic than nondiabetic patients, thus evaluating CAD in such patients is of prime importance.

**Objectives:** The aim of present study was to compare the extent of CAD in the diabetic and nondiabetic patients.

**Patients and Methods:** In this case-control study 65 diabetic patients (case group) were compared with 145 nondiabetic patients (control group) based on severity of coronary artery stenosis at heart center of Mostafa Khomeini hospital in Tehran (Iran) in 2007. Both groups were matched for age, sex and risk factors. Coronary artery status was evaluated by coronary angiography followed by analysis of data using statistical methods.

**Results:** Based on data found in our study, 93.8% of diabetic and 83.4% of nondiabetic patients were shown to suffer coronary artery stenosis. Severe involvement (grade 3VD) of coronary artery stenosis was observed in 44.6% and 28.8% of diabetic and nondiabetic patients, respectively. Statistically, a significant difference was found between two groups regarding the rate and severity of CAD ( $P < 0.05$ ). The occurrence of coronary stenosis was higher in females among both groups yet the difference insignificant, statistically ( $P > 0.05$ ).

**Conclusions:** Our findings revealed that the severity of coronary artery stenosis is common in diabetic patients compared to nondiabetics. Early diagnosis and treatment of CAD in diabetic patients is recommended.

**Keywords:** Diabetes Mellitus; Coronary Artery Disease; Coronary Stenosis; Angiography

## 1. Background

Coronary artery disease is one the important causes of mortality in most industrial communities. This leads to severe illness, weakness, loss of power and productivity which imposes huge expenditure on health services in different countries. There are many risk factors associated with CAD including blood hypertension, smoking, hyperlipidemia, diabetes, obesity, reduced physical activity, and hypercholesterolemia (1, 2). Diabetes mellitus is defined as a group of metabolic disorders with hyperglycemia as a common trait among them. Currently, there are approximately two hundred million people affected with diabetes worldwide and the prevalence is rising. This complication is considered as one of the important causes of disease and mortality among people over 60. Disorganized metabolic regulatory process associated with diabetes causes secondary pathophysiologic changes in various organs including cardiac coronary arteries leading to numerous problems both for the patient and the health care system (2, 3).

Many reports indicate that myocardial infarction and

associated cardiac diseases in diabetics are two to four times greater than non-diabetics (1-4). Uddin reported that the prevalence rate and degree of coronary artery involvement in diabetic patients is higher than those without diabetes (5).

## 2. Objectives

Addressing the high prevalence of diabetes (5%) among Iranian people, the present study was carried out at the Heart Center of Mostafa Khomeini Hospital (Tehran) to compare the degree of coronary artery stenosis in diabetic and nondiabetic patients.

## 3. Patients and Methods

This was a case-control study in which 65 patients with diabetes (case group) and 145 nondiabetic patients were compared based on degree of coronary artery stenosis during a six-month period in 2007. Followig initial medical observations and ECG, patients were tested for echo-

### Implication for health policy/practice/research/medical education:

The implication of this study is effects of the severity of coronary artery stenosis in diabetic and nondiabetic patients.

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cardiography, Candid treadmill, and coronary artery angiography. Both groups were matched for age, gender, and cardiovascular risk factors. All patients were justified and written agreement obtained. Angiography was performed by an experienced cardiologist using Siemens instrument and the degree of coronary artery stenosis was classified into 3 groups based on TIMI classification as follow: 1VD: involvement of one out of three major arteries and associated branches at a degree greater than 75%, 2VD: involvement of two out of three major arteries and associated branches at a degree greater than 75%, and 3VD: involvement of three major arteries and associated branches at a degree greater than 75%, LML: involvement of left main artery at a degree greater than 50%. The data were analyzed using SPSS and chi square test. P value < 0.05 was considered as significant.

#### 4. Results

Of 65 patients with diabetes (case group), 30 (47%) were males and 35 (53%) females whereas among 145 nondiabetics (control group) the gender distribution was 74 (51%) and 71 (49%) for males and females, respectively. The mean age in diabetics was  $61 \pm 5$  SD year and  $58 \pm 6$  SD in nondiabetics. There was no significant difference between two groups regard-

ing the sex and age ( $P > 0.05$ ). Coronary artery stenosis was found in 93.8% of patients with diabetes and 83.4% of those without diabetes as seen in Table 1 ( $P < 0.05$ ). Coronary artery stenosis was more common among females in both groups compared to males, nevertheless, the difference found to be insignificant, statistically as shown in Table 2 ( $P > 0.05$ ). The severity of coronary artery stenosis in diabetics, based on, TIMI classification was 44.6% (isolated 3VD and 3VD plus LML) and 25% (isolated 2VD and 2VD plus LML) whereas among nondiabetics, it was 28.8 and 27%, respectively. Statistically, there was a significant difference between two groups based on severity of coronary artery stenosis as shown in Table 3 ( $P < 0.05$ ). Totally, 69.6% of diabetics and 55.8% of nondiabetics were found to have coronary artery stenosis of both isolated 2VD and 3VD and accompanying LML types as shown in Table 3 ( $P < 0.05$ ).

**Table 1.** Distribution Frequency of Coronary Artery Stenosis Among Diabetic and Nondiabetic Patients ( $P = 0.04$ )<sup>a</sup>

	Diabetics	Nondiabetics
<b>Present</b>	61 (93.8)	121 (83.4)
<b>Absent</b>	4 (6.2)	16 (16.6)
<b>Total</b>	65 (100)	145 (100)

<sup>a</sup> Data are presented in No. (%).

**Table 2.** Distribution Frequency of Coronary Artery Stenosis Among Diabetic and Nondiabetic Patients Based on Gender ( $P = 0.83$ )<sup>a</sup>

	Diabetics	Nondiabetics	Total
<b>Present</b>			
Male	28 (43)	59 (40.6)	87 (41.4)
Female	33 (50.8)	62 (42.8)	95 (45.2)
<b>Absent</b>			
Male	2 (3.1)	15 (10.3)	17 (7.1)
Female	2 (3.1)	9 (6.3)	11 (5.25.2)
<b>Total</b>	65 (100)	145 (100)	210 (100)

<sup>a</sup> Data are presented in No. (%).

#### 5. Discussion

The data of present study showed that the degree and severity of coronary artery stenosis in diabetic patients is significantly higher than those of nondiabetics and the rate of involvement was found to be higher in females compared to males. Coronary artery disease is one of the major causes of morbidity and mortality in both industrial and non-industrial countries worldwide and will be the most common cause of death by 2025. Myocardial infarction is the main manifestation of coronary artery disease. The availability of modern diagnostic equipments in developed countries has led to a reduction in mortality rate of myocardial infarction; however, it is still one of the important causes of death in developing countries (1, 2, 6, 7). There are several predisposing factors increasing the risk of coronary artery disease including smoking, hyperlipidemia, obesity, and diabetes (1, 2, 8). Dia-

betes is a constellation of metabolic disorders generally characterized by hyperglycemia and produced through complex reactions occurring between genetic factors, environmental agents, and the lifestyle (1, 2). The prevalence of diabetes in both developing and advanced countries is rising as it is predicted that the prevalence of 4% in 1995 will be increased to 5.4% by 2025 (9).

Numerous studies have been carried out regarding the prevalence rate of coronary artery disease in patients with diabetes. The study by Uddin on 50 patients with type II diabetes and equal number of nondiabetics showed that 76% of diabetics and 62% of patients without diabetes were affected by coronary artery stenosis and the severity and extent of involvement of coronary artery found to be higher in diabetics compared with nondiabetics (5). In a cohort study it was demonstrated that the

risk of developing coronary artery atherosclerosis in diabetic patients is 3-4 times higher than that of nondiabetics. Similar findings are reported in studies by Laakso et

al. (10), Quadros et al. (11), Forssas et al. (12), Freedman et al. (13), and Molstad et al. (14). Ledru et al. described that the obstruction of coronary artery is more common in

**Table 3.** Comparison of Degree of Coronary Artery Stenosis in Diabetic and Nondiabetic Patients ( $P = 0.02$ )<sup>a, b</sup>

	Diabetics	Nondiabetics
<b>1VD</b>		
Male	6 (9.2)	18 (12.4)
Female	6 (9.2)	21 (14.5)
<b>2VD</b>		
Male	7 (10.7)	20 (13.85)
Female	9 (13.7)	18 (12.83.7)
<b>2VD and LML</b>		
Male	2 (0.3)	2 (0.2)
Female	2 (0.3)	2 (0.2)
<b>3VD</b>		
Male	13 (16.9)	16 (11)
Female	16 (20)	19 (13.1)
<b>3VD and LML</b>		
Male	2 (3.1)	3 (2.7)
Female	3 (4.6)	2 (2)
<b>No Stenosis</b>		
Male	2 (3.1)	15 (10.3)
Female	2 (3.1)	9 (6.3)
<b>Total</b>	65 (100)	145 (100)

<sup>a</sup> Abbreviation: LML, left medial lateral; VD, vessel disease.

<sup>b</sup> Data are presented in No. (%).

patients with type III diabetes with higher degree of stenosis and involvement of coronary arteries mostly affecting the distal arteries, anatomically (3).

In our study the occurrence of coronary artery stenosis was higher in females among both groups, a finding consistent with the data found in a study by Goraya et al. (15). There are many factors which influence the development of coronary artery disease in patients with diabetes including the synergistic effect of hyperglycemia on other cardiac risk factors such as dyslipidemia, hypertension, and obesity. However, there are diabetes-specific risk factors such as microalbuminuria, proteinuria, platelets and endothelial cells dysfunction, increased resistance to insulin, and increase level of plasminogen and fibrinogen inhibitors, which enhance the risk of developing coronary artery disease (1, 2). Having described our data and those of others, early diagnostic and precautionary procedures are necessary to prevent coronary artery disease in diabetic patients.

The data of present study showed that the prevalence rate and degree of coronary artery stenosis was higher among diabetic patients compared to nondiabetics. Serious attempt in early diagnosis of coronary artery disease in diabetics is recommended.

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## Author's Contribution

Study concept and design: Ebrahimi; Analysis and interpretation of data: Pahlavan; drafting of the manuscript: Ebrahimi, Pahlavan, Khalaj; critical revision of the manuscript for important intellectual content: Ebrahimi, Salimi; statistical analysis: Salimi.

## Financial Disclosure

The authors report no conflicts of interest in this work.

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