

## Angiographic profile in diabetic and non-diabetic patients with coronary artery disease in the Cardiac Specialty Hospital – Cardiac Center, Erbil, Iraq

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### Abstract

**Background and objective:** Diabetic patients show two to three times higher risk of developing coronary artery disease than non-diabetics particularly in type 2 diabetes mellitus. This study aimed to find out the adverse effects of type 2 diabetes on coronary artery anatomy and the association of different socio-demographic characteristics with diabetic and non-diabetic patients with coronary artery disease.

**Methods:** An angiographic based cross-sectional study was conducted on 150 patients with coronary artery disease attending cardiac specialty hospital – cardiac center in Erbil city between May and September 2015. Seventy five patients of them were type-2 diabetes and others were non-diabetics.

**Results:** Significantly higher differences in age, sedentary lifestyle, and hypertension were seen among type-2 diabetics than non-diabetics. Development of critical and diffuse coronary artery lesions was significantly higher among type-2 diabetics than non-diabetics. Triple vessels disease was significantly higher among type-2 diabetic patients.

**Conclusion:** Type-2 diabetes significantly affects the anatomy of coronary arteries, and is associated with age, sedentary lifestyle, and hypertension. The findings are comparable to those of different studies in different countries.

**Keywords:** Coronary artery disease; Angiography; Type-2 diabetes.

### Introduction

Cardiovascular diseases (CVDs) remain the biggest cause of deaths worldwide,<sup>1</sup> contributing to 30% of global mortality and 10% of the global disease burden.<sup>2,3</sup> In 2005, the worldwide percentage of mortality due to CVDs and coronary heart diseases (CHDs) was 29.3% and 13.1% respectively.<sup>4,5</sup> Globally, different risk factors are associated with increased incidence and mortality from CHDs, diabetes mellitus (DM) is one of these risk factors.<sup>1</sup> Diabetes mellitus ranked the 2<sup>nd</sup> commonest cause of worldwide non communicable diseases (NCDs) mortality next to CVDs.<sup>6</sup> Diabetics show 2-3 times higher risk of developing coronary artery disease than non-diabetics particularly type 2 DM were dyslipidemia is common.<sup>7</sup> Correlation between diabetes mellitus and coronary heart disease was established at 1870 after the work of

Seegen J, Der, who emphasized the higher incidence and mortality of coronary artery disease (CAD) among diabetics.<sup>6</sup> Nationally, despite limitations in the mortality statistics available in Iraq, CVDs was the leading cause of death. Hospital morbidity data provided by the MOH indicates a 65% increase in hospital admissions due to CHDs between 1989 and 1999.<sup>8</sup> Often in low and middle income countries there is a lack of information on the role of different risk factors in the development of CHDs.<sup>1</sup> This study is an angiographic-based study aimed to find out the adverse effects of type 2 diabetes on coronary artery anatomy, and association of different socio-demographic characteristics with diabetic and non-diabetic patients with CAD.

### Methods

A hospital based cross –sectional study

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was performed on 150 patients with CAD; 75 patients of them were diabetics and others were non-diabetics. The study was conducted between May and Sep 2015 at the cardiac specialty hospital / cardiac center, Erbil, Iraq. Patients with CAD and known to have type 2 diabetes were included in group 1, and patients with CAD proved to be non-diabetics were included in group 2. The diagnosis of diabetes mellitus was established when the fasting plasma glucose levels were higher than 126 mg/dl or the patient reported receiving hypoglycaemic treatment.<sup>9</sup> Patients with type 1 diabetes, valvular heart disease, left ventricle hypertrophy, cardiomyopathy, and congestive heart failure were excluded from the study. All study participants are known to have CAD confirmed by the typical history of the disease, electrocardiography (ECG), and positive exercise ECG test. Coronary angiography was performed for all patients according to guidelines. Data on age, gender, family history of CAD in first degree relatives, body mass index (BMI), waist circumference, lifestyle, smoking, drinking, and hypertension and the results of coronary angiography were recorded in an especially designed questionnaire. Patients with mean blood pressure level greater or equal to 140/90 mmHg or those reported taking antihypertensive medications were classified as hypertensive.<sup>10</sup> Angiographic findings were interpreted by the same intervention cardiologist. Lesions affecting ( $\geq 50\%$ ) left main coronary artery lumen or  $\geq 70\%$  of other coronary vessel lumen called Critical lesion. On the other hand, a critical lesion affecting single coronary vessel called single vessel disease (SVD), if two vessels called double vessel disease (DVD), and if three vessels called triple vessels disease (TVD). Critical lesion affecting three of five segments of the left anterior descending artery (LAD) and left circumflex artery (LCX) or two of four segments of right coronary artery (RCA), it is called diffuse coronary artery disease. BMI was classified according to world

health organization classification in 2012 into underweight ( $<18.5 \text{ Kg/m}^2$ ), normal weight ( $18.5\text{-}24 \text{ Kg/m}^2$ ) overweight ( $25\text{-}29 \text{ Kg/m}^2$ ), and obese ( $30\text{+} \text{ Kg/m}^2$ ).<sup>11</sup> Statistical analysis was performed by using the statistical package for the social sciences (version 17). Chi-square test and independent t test were used to calculate the significant differences between different study variables. A *P* value of  $\leq 0.05$  was considered statistically significant. The study was approved by research ethics committee of College of Medicine of Hawler Medical University. Informed written consent was obtained from each patient before being enrolled in the study.

## Results

The mean age  $\pm$  SD of the study participants was  $58.25 \pm 10.6$  years with a range of 27-80 years. The mean age of diabetic patients ( $59.4 \pm 9.20$  years) was significantly (*P* = 0.011) higher than that of non-diabetics ( $57.11 \pm 11.19$  years). Around 75% diabetic patients and 53% of non-diabetics were in the 6<sup>th</sup> and 7<sup>th</sup> decades of age with statistical significant variations between the age groups (*P* = 0.019). The mean BMI and waist circumference  $\pm$  SD of the study sample were  $30.19 \pm 5.11 \text{ Kg/m}^2$  and  $105.92 \pm 10.97$  cm, respectively. Sedentary lifestyle was significantly (*P* = 0.014) higher among diabetic patients (96.0%) than non-diabetics (84%). Hypertension was also significantly (*P* = 0.029) higher among diabetic patients (70.7%) than non-diabetics (53.3%). Other socio-demographic variables had no significant associations (Table 1).

**Table 1:** Association of diabetes with certain socio-demographic characteristics and other epidemiological variables.

Variables	Non-Diabetics		Diabetics		P value
	No.	%*	No.	%*	
Age: (Mean age $\pm$ SD = 58.25 $\pm$ 10.6)					
< 50	23	30.7	8	10.7	0.019
50-59	18	24.0	26	34.7	
60-69	22	29.3	30	40.0	
70+	12	16.0	11	14.7	
Gender					
Male	43	57.3	37	49.3	0.326
Female	32	42.7	38	50.7	
BMI: (Mean BMI $\pm$ SD = 30.19 $\pm$ 5.11)					
<18.5	0	0.0	0	0.0	0.118
18.5-24	14	18.7	6	8.0	
25-29	26	34.7	34	45.3	
30+	35	46.7	35	46.7	
Waist circumference: (Mean $\pm$ SD =105.92 $\pm$ 10.97)					
Normal	15	20.0	11	14.7	0.388
High	60	80.0	64	85.3	
Smoking					
No	7	9.3	3	4.0	0.19
Yes	68	90.7	72	96.0	
Alcohol					
No	68	90.7	73	97.3	0.086
Yes	7	9.3	2	2.7	
Lifestyle					
Sedentary	63	84.0	72	96.0	0.014
Active	12	16.0	3	4.0	
Family history of CAD					
No	62	82.7	63	84.0	0.827
Yes	13	17.3	12	16.0	
Hypertension					
No	35	46.7	22	29.3	0.029
Yes	40	53.3	53	70.7	
Total	75	100.0	75	100.0	

\* Column percent

Triple vessel involvement was significantly ( $P = 0.012$ ) higher among diabetic patients (60.0%), while single and double vessel involvement was more frequent among non-diabetic than diabetic patients (57.3% and 34.6%, respectively). Details are shown in Table 2. Unlike left main coronary artery, the proportion of critical lesions in major

coronary arteries (LAD, LCX, and RCA) was higher than that of non-critical lesions in both diabetics and non-diabetics. However, only left circumflex artery demonstrated a significant ( $P = 0.01$ ) critical lesions among diabetics than non-diabetics (42.7% and 26.7%, respectively). Details are shown in Table 3.

**Table 2:** Number of coronary arteries involved among diabetic and non-diabetic patients.

No. of vessels	Non-Diabetics		Diabetics		P value
	No.	%*	No.	%*	
No	7	9.3	4	5.3	0.012
Single	19	25.3	10	13.3	
Double	24	32.0	16	21.3	
Triple	25	33.3	45	60.0	
Total	75	100.0	75	100.0	

\* Column percent.

**Table 3:** Types of coronary arteries involved among diabetic and non-diabetic patients.

Coronary artery involved	Non-Diabetics		Diabetics		P value
	No.	%*	No.	%*	
Left main stem (LMS)					
Normal	67	89.3	67	89.3	0.319
Non-critical	6	8.0	8	10.7	
Critical	2	2.7	0	0.0	
Left anterior descending (LAD)					
Normal	16	21.3	8	10.7	0.186
Non-critical	17	22.7	17	22.7	
Critical	42	56.0	50	66.7	
Left circumflex (LCX)					
Normal	39	52.0	21	28.0	0.01
Non-critical	16	21.3	22	29.3	
Critical	20	26.7	32	42.7	
Right coronary artery (RCA)					
Normal	30	40.0	20	26.7	0.148
Non-critical	11	14.7	18	24.0	
Critical	34	45.3	37	49.3	
Total	75	100.0	75	100.0	

\* Column percent.

The proportion of non-diffuse critical coronary artery lesions was significantly ( $P < 0.001$ ) higher among non-diabetics (52.0%) than diabetics (26.7%). On the other hand, diffuse critical lesions were significantly higher in diabetics (56.0%) than non-diabetics (16.0%). These results are demonstrated in Table 4.

### Discussion

This study revealed that diabetics had a significantly higher mean age than non-diabetics. This finding is similar to that reported in Davangere-India in 2014,<sup>7</sup> Brazil between 1993 and 2001,<sup>12</sup> Gaza-Palestine between 2010 and 2013,<sup>13</sup> Albania between 2012 and 2014,<sup>14</sup> and Bangladesh in 2009.<sup>15</sup> However, other studies carried out in Nablus-Palestine in 2009,<sup>16</sup> Milan-Italy between 2007 and 2008,<sup>17</sup> Nepal between 2011 and 2013,<sup>18</sup> and Baghdad in 2009<sup>19</sup> revealed no significant age variations. The finding that sedentary lifestyle was significantly higher among diabetic patients than non-diabetics is similar to that of Nablus-Palestine<sup>16</sup> study. However, studies in Brazil,<sup>12</sup> and India<sup>20</sup> revealed no significant association. Hypertension was significantly associated with diabetes. This finding agrees with those reported by studies in Bangladesh in 2009,<sup>15</sup> and Germany in 2010.<sup>21</sup> However, other studies in Brazil,<sup>12</sup> Netherland between 2011 and 2013,<sup>22</sup> and Baghdad between 2008 and 2009<sup>23</sup> revealed no significant association with hypertension.

The insignificant association with smoking revealed by this study is similar to that reported in Milan-Italy,<sup>17</sup> Germany,<sup>21</sup> and Netherland.<sup>22</sup> However, other studies in Bangladesh,<sup>15</sup> Nablus-Palestine,<sup>16</sup> and Baghdad<sup>23</sup> reported no association. Similarly, the insignificant association with BMI in this study is comparable to that reported in Gaza-Palestine,<sup>13</sup> India,<sup>20</sup> and Finland,<sup>24</sup> while studies in Nablus-Palestine,<sup>16</sup> and Pisa-Italy<sup>25</sup> revealed a significant association. A higher proportion of triple coronary arteries involvement among diabetic patients revealed by this study is similar to that reported in Brazil,<sup>12</sup> India,<sup>20</sup> Baghdad between 2008 and 2009,<sup>23</sup> and Pakistan.<sup>26</sup> On the other hand, studies in Albania,<sup>14</sup> and Milan-Italy,<sup>17</sup> revealed no significant risk. The significant association of critical lesions in left circumflex artery among diabetic patients demonstrated in this study is similar to that reported by studies in Milan-Italy,<sup>17</sup> Baghdad in 2009,<sup>19</sup> and Netherland.<sup>22</sup> However, other studies in Davangere-India,<sup>7</sup> and Bangladesh<sup>15</sup> revealed no significant association. On the other hand, the significant association of diffuse coronary artery lesions with diabetes demonstrated in this study is similar to that reported in Brazil,<sup>12</sup> France,<sup>27</sup> and Bangladesh.<sup>28</sup> However, another study in France<sup>29</sup> revealed no statistical differences for diffuse coronary artery lesions between diabetics and non-diabetics.

**Table 4:** Nature of coronary artery lesions among diabetic and non-diabetic patients.

Nature of coronary lesion	Non-Diabetics		Diabetics		P value
	No.	%*	No.	%*	
Normal	7	9.3	4	5.3	< 0.001
Non-critical	17	22.7	9	12.0	
Critical non-diffuse	39	52.0	20	26.7	
Critical diffuse	12	16.0	42	56.0	
Total	75	100.0	75	100.0	

\* Column percent.

## Conclusion

Type-2 diabetes significantly affects the anatomy of coronary arteries and is associated with age, sedentary lifestyle, and hypertension. A higher proportion of triple coronary arteries disease, critical lesions in the left circumflex artery and diffuse coronary artery lesions were demonstrated in diabetic patients in this study; findings that are comparable to those of different studies in other countries.

## Conflicts of interest

The author reports no conflicts of interest.

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