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Original Article

The Association Between Coronary Artery Disease and Type 2 Diabetes Mellitus in Libyan Adults: A Cross-Sectional Study

Razk Abdalgwad[1], Ali Fadhlullah[2*], Ahmed Balha[1]
[1]*Department of Internal Medicine, Faculty of Medicine, University of Omar El mukhtar, Derna –Libya.*
[2]*Department of Internal Medicine, Faculty of Medicine, University of Omar El mukhtar, Albayda –Libya*
Corresponding Email: ali.aref76@yahoo.com

ABSTRACT

Background and objectives. *Diabetes mellitus is a highly prevalent chronic multisystem disease and it has a significant impact on the health of many important organs in our body, including the cardiovascular system (CVS). This study aimed to determine the association between Type 2 diabetes mellites (T2DM) and the development of coronary artery disease (CAD).* ***Methods****. A retrospective cross-sectional study was conducted on patients who were diagnosed with CAD and T2DM. We examined the likelihood occurrence of CAD in T2DM patients using the Bayesian one sample test.* ***Results****. About 97 patients were confirmed to have CAD and were included in the study. The mean age of participants was 60±11.89. Approximately, 53 (54.6%) of patients were females, while 44 (45.4%) were males. The vast majority of patients had T2DM and CAD at 69 (71.1%) as opposed to only 28 (28.9%) of patients who did not have T2DM but had CAD. Moreover, there was a statistically significant increase in the likelihood of occurrence of CAD amongst the T2DM group. The percentage of patients who have T2DM with CAD was significantly higher than those who were not diagnosed with T2DM but had CAD at 69 (71.1%) compared to 28 (28.9%) (P = 0.002) for the group of T2DM concomitant with CAD, and the group of non-T2DM concomitant with CAD, respectively.* ***Conclusion****. There was a significant relationship between T2DM and CAD, suggesting the importance of intensive glycemic control in diabetic patients possibly via lifestyle modifications or medications in order to reduce or delay the possibility of occurrence of CAD amongst diabetic patients, in particular.*

Keywords*: T2DM, CAD, Libya, Medication, Lifestyle.*

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INTRODUCTION

Patients with type 2 diabetes mellitus (T2DM) have a higher risk of developing coronary artery disease (CAD) than do patients without T2DM [1]. Additionally, 75% of T2DM patients die as a consequence of cardiovascular diseases, including CAD [2]. Moreover, compared with matched non diabetic individuals, patients with diabetes have a higher prevalence, extent, and severity of CAD [3]. T2DM negatively affects the prognosis of patients by markedly increasing both hospitalization and mortality rate [4]. The American Diabetes Association and American Heart Association issued a joint statement that urges the identification of asymptomatic patients with subclinical CAD in whom more aggressive lifestyle or treatment changes would allow prevention of progression of the disease and reduce future clinical events [5]. Ongoing

metabolic disturbances such as insulin resistance, hyperinsulinemia, hyperglycemia, and dyslipidemia associated with hematologic abnormalities and inflammatory response related to T2DM justify the complexity and severity of coronary lesions and faster progression of atherosclerotic disease, thus, poor outcomes even after the revascularization with the third generation of drug-eluting stent [6,7]. T2DM might also cause functional alterations in the absence of obstructive coronary stenosis [8].

The aim of this study was to assess the Association between T2DM and CAD among Libyan patients.

METHODS

Study design and settings

This was a retrospective cross-sectional study carried out in the cardiac clinic at Alwahada Teaching Hospital, Derna city. Inclusion criteria for the study are male and female patients with CAD, age >30 years old, and T2DM. Those who were not known to have CAD or were younger than 30 years old were excluded from the study. For the purpose of the current study, data was gathered retrospectively from paper-based medical records, including information regarding gender, age, T2DM, and CAD. To better examine the association between CAD and T2DM, we have categorized the participants into two groups. Those who have been diagnosed with CAD and T2DM and those who have not been diagnosed with T2DM but have CAD. Additionally, we have divided patients into two subgroups according to their age (those over the age of 60 and those under the age of 60 years old) to better predict the association between CAD, T2DM (as dependent variables) and age groups, and sex (as independent variables).

Statistical analysis

SPSS version 25 was used to conduct all statistical analysis. Descriptive statistics were used to describe demographic characteristic of participants. Categorical variables were presented as numbers and percentages, while continuous variables were presented as mean and standard deviations. To compare the categorical variables between the two groups (CAD with T2DM group, and CAD without T2DM group), Pearson's chi-square test was used, while independent-sample t-test was used to compare the means for the continuous variables between the two groups. We used the Bayesian one sample test to predict the likelihood of occurrence of CAD in the T2DM and non-T2DM groups. Binary logistic regression analysis was used to best determine the predictors for CAD in addition to T2DM such as age groups (those over the age of 60 and those under the age of 60 years old), and gender.

RESULTS

Demographic characteristics of patients diagnosed with CAD and T2DM are shown in table 1. In total, 97 patients confirmed to have CAD and were included in the study. The mean age of participants was 60±11.89. 53 (54.6%) of patients were females, while 44 (45.4%) were males. The vast majority of patients had T2DM and CAD at 69 (71.1%) as opposed to only 28 (28.9%) of patients who did not have T2DM but had CAD.

We have divided the patients into T2DM and non-T2DM groups to predict the likelihood of occurrence of CAD amongst participants. Based on the result of the Bayesian one-sample test, we have noticed that there was a statistically significant increase in the likelihood of occurrence of CAD amongst the T2DM group. The percentage of patients who have T2DM with CAD was significantly higher than those who were not diagnosed with T2DM but had CAD at 69 (71.1%) compared to 28 (28.9%) (P = 0.002) for the group of T2DM concomitant with CAD, and the group of non-T2DM concomitant with CAD, respectively.

In the diabetic group, gender was not statistically different compared to gender in the non-diabetic group, but clinically the percentages of males and females in the diabetic group appear to be higher than those in the non-diabetic group at 30 (31.0%), and 39 (40.2%) for males, and females in the diabetic

group compared to 14 (14.4%), and 14 (14.4%) (P = 0.559) for males, and females in the non-diabetic group, respectively (Table 1). Also, there is an increased risk of CAD in males and females by an odds ratio of 1.30 [0.539 – 3.136], but this was not statistically significant.

A similar result was obtained when using binary logistic regression where gender was not statistically significant predictor for CAD among diabetic and non-diabetic groups at β coefficient of 0.283, 95%CI= [0.548-3.21] (P = 0.530).

To recognize if age is determinant for CAD we categorized patients according to their age into two sub-groups, those who are more than 60 years old and those who are less than 60 years old in both diabetic and non-diabetic groups, respectively. We have found that there were higher percentages of CAD among those who were diabetic and older than 60 years old as opposed to the non-diabetic and aged more than 60 years group at 33 (34.0%) and 13 (13.4%), respectively. The same applies to the age group of less than 60 years old where the incidence of CAD was higher among those who are diabetic and younger than 60 years old compared to those who are not diabetic and younger than 60 years old at 36 (37.1%) and 15 (15.5%) (P = 0.901), respectively (Table 1).

Additionally, age was not significantly associated with increased risk of IHD in diabetic and non-diabetic groups by an odds ratio of 0.945 [0.392-2.280]. Similarly, using binary logistic regression analysis β coefficient of age was not significantly associated with CAD at – 0.013, 95%CI= [0.951-1.025] (P = 0.505).

Table 1. Demographic patient characteristics and association between CAD and T2DM.

Parameters	All patients	Diabetic group	Non-diabetic group	*P*-value
N (%)	97(100%)	69(71.1%)	28(28.9%)	-
Gender				
Female	53(54.6%)	39(40.2%)	14(14.4%)	0.559
Male	44(45.4%)	30(31.0%)	14(14.4%)	
Age (years)	60±11.89	60.8±12.69	59.14±9.92	0.53
Age groups (years)				
<60 years old.	51(52.6%)	36(37.1%)	15(15.5%)	0.901
>60 years old.	46(47.4%)	33(34.0%)	13(13.4%)	
CAD	97 (100%)	69 (71.1%)	28(28.9%)	0.002*

Values are presented as mean ± SD for continuous variables.
Comparisons between groups with continuous variables were made using independent samples t test.
Proportions with categorical variables were compared using Pearson's Chi-square test.
**Denote that the P-value was reported from Bayesian one sample test.*
N (%): Numbers and percentages, T2DM: Type 2 Diabetes, CAD: Coronary Artery Disease.

DISCUSSION

In this study, we have specifically focused on the effect of T2DM on cardiovascular health. Amongst a cohort of Libyan patients, we have found that there is a significant association between the development of CVD and T2DM. Our finding is almost similar to what has been previously mentioned in many studies on diabetes as a leading cause of cardiovascular disease [9-11].

The risk of development of CAD in T2D patients is mainly attributed to atherosclerosis phenomena which is associated with inflammation in arterial wall leading to accumulations of oxidized lipoproteins and white blood cells and subsequent formation of atherosclerotic plaques [12]. Intensive glycemic control has been linked to the reduction in the risk and progression of both micro-and macrovascular complications among patients with type 1 and T2DM in The Diabetes Control and Complications Trial (DCCT) and the United

Kingdom Prospective Diabetes Study (UKPDS) [13]. Therefore, it's crucial to emphasize maintaining blood glucose within normal levels for diabetic patients.

This study has a number of important limitations. Firstly, the retrospective nature of the study, therefore the future study would focus in a prospective design on the relationship between CAD and T2DM possibly in the similar cohort of patients. Secondly, the smaller sample size and this makes the results of this study would not be generalized to the general population. However, the significant outcomes of the study may add valuable and sufficient knowledge to the previous research on the T2DM as an important risk factor for the development of CAD.

In conclusion, we have found that there is a significant relationship between T2DM and CAD and this study highlights the importance of intensive glycemic control in diabetic patients possibly via lifestyle modifications and medications in order to reduce or delay the possibility of occurrence of CAD amongst diabetic patients, in particular.

Disclaimer

The article has not been previously presented or published, and is not part of a thesis project.

Conflict of interest

We declare that they have no competing interests.

Author contributions

All authors contribute equally in this manuscript.

Abbreviations

CAD: Coronary Artery Disease; CVS: Cardiovascular system; DCCT: The Diabetes Control and Complications Trial; N (%): Numbers and percentages; SPSS: Statistical Package for the Social Sciences; T2DM: Type 2 Diabetes Mellitus; UKPDS: The United Kingdom Prospective Diabetes Study.

Data availability statement

The data can be made available upon request.

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