Original Article

The Prevalence of Hypertriglyceridemia, and Hyperuricemia in Libyan Adults diagnosed with Coronary Artery Disease, Type 2 Diabetes, and Hypertension: A Cross-Sectional Study

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ABSTRACT

Background and aims*. Coronary artery disease (CAD) is associated with increased morbidities and mortalities and has become increasingly prevalent especially in those who have already had predisposing factors such as T2DM and hypertension. We firstly aimed to determine the prevalence of hypertriglyceridemia, and hyperuricemia in Libyan adults with CAD combined with T2DM and hypertension. Then, we secondly aimed to examine the prevalence of T2DM, hypertension, hypertriglyceridemia, and hyperuricemia in all patients with established CAD.* ***Methods****. This was a retrospective cross-sectional study of Libyan adults with established CAD. Descriptive statistics was used to interpret the prevalence of T2DM, hypertension, hypertriglyceridemia, and hyperuricemia in patients with CAD. Prevalence was calculated using the following equation :(Prevalence= Number of cases/ Total number of participants in the study*100).* ***Results****. In total, 49 patients with CAD combined with T2DM and hypertension were included in the study. 28 (57.1%) were females, and 21 (42.9%) were males. The mean age was 60 ± 11.89 years. The prevalence of hypertriglyceridemia was much higher than hyperuricemia in patients with CAD combined with T2DM and hypertension at 44 (89.8%) and 33 (67.3%), respectively. Moreover, in all patients with CAD (N = 97) hypertriglyceridemia still the highest prevalence at 81(83.5%), followed by T2DM at 69 (71.1), respectively.* ***Conclusion****. We have found amongst Libyan patients with CAD that hypertriglyceridemia had the highest prevalence followed by T2DM, then hyperuricemia, while hypertension had the lowest prevalence. Further studies are needed to focus in more details on these outcomes maybe in larger number of patients with established CAD.*

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INTRODUCTION

The subject of diabetes mellitus as a comorbid disease that frequently confounds hypertension, adding significantly to its overall morbidity and mortality [1]. Although T2DM and hypertension can be simply diagnosed at the bedside, they are each complex and heterogeneous phenotypes associated with an elevated risk of life-threatening cardiovascular disease. Their frequent coexistence in the same individual is not a coincidence, because aspects of the pathophysiology are shared by both conditions, particularly those related to obesity and insulin resistance. For example, in the San Antonio Heart Study, 85% of those with T2DM had hypertension by the fifth decade of life, whereas 50% of those with hypertension experienced impaired glucose tolerance or T2DM [2].

Numerous complex metabolic, neurovascular, genetic and hormonal factors increase the risk of developing hypertension or T2DM when the other already exists. The association of hypertension with T2DM is consistent across most, if not all populations [3-5]. Prospective studies have shown incidence rates of hypertension in diabetes to be three times that of subjects without diabetes [6-8]. The reverse also applies, with the incidence of diabetes two to three times higher in patients with hypertension than those without [8, 9].

Coronary artery disease is common to both diabetes and hypertension, and contributes to cardiac dysfunction and the risk of cardiovascular (including sudden) death. Patients with either diabetes or hypertension have an increased burden of silent myocardial ischemia [10, 11].

From what has been mentioned above it's evident that the relationship between CAD, T2DM, and hypertension exists and is interchangeable and multifactorial. The primary endpoint of the current study was to investigate the Prevalence of hypertriglyceridemia, and hyperuricemia amongst Libyan patients diagnosed with CAD, T2DM, and hypertension combined together. The secondary endpoint was to examine the prevalence of possible risk factors for CAD namely T2DM, hypertension, hypertriglyceridemia, and hyperuricemia in all patients regardless if they had CAD combined only with T2DM, CAD combined only with hypertension, or the three conditions (CAD, T2DM, and hypertension) combined together.

METHODS

Study design and settings

We have retrospectively conducted a cross-sectional study to determine the Prevalence of hypertriglyceridemia, and hyperuricemia in a cohort of Libyan patients who have already been diagnosed with CAD combined with comorbidities namely T2DM, and hypertension. This study was conducted in the Cardiac Clinic at Alwahada Teaching Hospital, Derna city. Questionnaire was developed to collect information either from patients directly or from their medical records including gender, hypertension, T2DM, CAD, TGs, and uric acid levels. The inclusion criteria were male and female patients with CAD combined with both T2DM and hypertension and age $\geqslant$ 30 years old. Those who have had either only CAD with T2DM or CAD with hypertension were excluded from the study (we have only included patients with all three conditions combined together namely CAD, T2DM, and hypertension), those who were younger than 30 years old were also excluded from the study.

Also, for our knowledge we were curious to determine the prevalence of possible risk factors for CAD in all patients in our study. These risk factors include T2DM, hypertension, hypertriglyceridemia, and hyperuricemia. We examined each factor separately in association with CAD.

Statistical analysis

SPSS version 22 was used to conduct all statistical analysis. We used descriptive statistics to describe demographic characteristics of patients. All categorical variables were described as numbers and percentages, while continuous data were interpreted as mean and standard deviations. To determine the prevalence of T2DM, hypertension, hypertriglyceridemia, and hyperuricemia the following equation was used: (Prevalence= Number of cases/ Total number of participants in the study*100).

RESULTS

This approach provided a perfect retention and out of 97 patients with CAD, we have included only 49 patients with CAD combined with T2DM and hypertension. This was the purpose of the primary endpoint of the study where we meant to determine the prevalence of hypertriglyceridemia, and hyperuricemia amongst patients with CAD, T2DM, and hypertension combined together. Therefore, in (Table 1) we have 49 patients with established CAD, T2DM, and hypertension. 28 (57.1%) were females, while only 21 (42.9%) were males. The mean age was 60 ± 11.89 years. We can clearly see that the prevalence of hypertriglyceridemia was much higher in patients diagnosed with CAD combined with T2DM, and hypertension as compared to those with normal triglyceride levels but had CAD, T2DM, and hypertension at 44 (89.8%) and 5 (10.2), respectively. Moreover, hypertriglyceridemia was more prevalent than hyperuricemia at 44 (89.8%) and 33 (67.3%), respectively. Interestingly, the prevalence of those who had hyperuricemia and diagnosed with CAD, T2DM, and hypertension was higher than those with normal uric acid levels and had CAD, T2DM, and hypertension at 33 (67.3%) and 16 (32.7%), respectively (Table 1).

For our knowledge, we were curious in the secondary endpoint of the study to determine the prevalence of T2DM, hypertension, hypertriglyceridemia, hyperuricemia in all patients with CAD (Table 2). Therefore, in the secondary endpoint, we have 97 patients were eligible to be a part of this analysis. We can clearly see that from (Table 2) hypertriglyceridemia reported to have the highest prevalence over the other risk factor for CAD at 81 (83.5%) as opposed to 16 (16.5%) for those with hypertriglyceridemia and normal triglyceride levels, respectively. The second on the list was for T2DM where the prevalence of patients with CAD combined with T2DM was higher than those who had CAD without T2DM at 69 (71.1%) and 28 (28.9%), respectively. Adversely, the lowest prevalence was for those with CAD combined with hypertension at 63 (64.9%) compared to 34 (35.1%) for those without hypertension but had CAD, respectively (Table 2).

Table 1. Demographic characteristics of patients with CAD, T2DM, hypertension and the prevalence of hypertriglyceridemia, and hyperuricemia.

Variables	Patients with CAD, T2DM, and hypertension
N (%)	49 (100%)
Gender	
Female	28 (57.1%)
Male	21 (42.9%)
Age (years)	60 ± 11.89
HyperTG*	
Yes	44 (89.8%)
No	5 (10.2%)
Hyperuricemia*	
Yes	33 (67.3%)
No	16 (32.7%)

*Values are presented as mean ± SD for continuous variables. *Denote that the Prevalence for hypertriglyceridemia, and hyperuricemia was determined using the following equation: (Prevalence= number of cases/ total number of participants*100).*
N (%): Numbers and percentages, CAD: Coronary Artery Disease, hyperTG: Hypertriglyceridemia, T2DM: Type 2 Diabetes. All patients diagnosed with CAD, T2DM, and hypertension.

Table 2. The prevalence of possible independent risk factors for CAD in all patients (N=97).

Variables	All patients diagnosed with CAD
N (%)	97 (100%)
Gender	
Female	53 (54.6%)
Male	44 (45.4%)
Age (years)	60 ± 11.89
T2DM*	
Yes	69 (71.1%)
No	28 (28.9%)
HTN*	
Yes	63 (64.9%)
No	34 (35.1%)
HyperTG*	
Yes	81 (83.5%)
No	16 (16.5%)
Hyperuricemia*	
Yes	67 (69.1%)
No	30 (30.9%)

*Values are presented as mean ± SD for continuous variables. *Denote that the Prevalence for T2DM, hypertension, hypertriglyceridemia, and hyperuricemia was determined using the following equation: (Prevalence= number of cases/ total number of participants*100).*
N (%): Numbers and percentages, CAD: Coronary Artery Disease, hyperTG: Hypertriglyceridemia, T2DM: Type 2 Diabetes. All patients diagnosed with CAD.

DISCUSSION

T2DM has been linked to elevated risks for CAD development, increased mortality, and decreased life expectancy by approximately 15 years [12,13]. T2DM has been, in particular, associated with increased risk for cardiovascular mortality by about 5-folds [12,13]. Hypertension itself when occurs in association with T2DM the risk for CVS becomes even much higher [14]. We have found in our study that in patients with established CAD hypertriglyceridemia had the highest prevalence amongst the other risk factors in this study (T2DM, hyperuricemia, and hypertension), followed by T2DM which reported to be the second highest prevalent risk. Though, in general, all studied possible risk factors in our study namely hypertriglyceridemia, T2DM, hyperuricemia, hypertension was found to be more prevalent in patients with CAD when we compared them to the patients who had CAD but had not these risk factors.
A long-standing relationship exists between high serum triglyceride levels and cardiovascular disease (CVS) development [15,16]. Moreover, in fact, serum triglyceride levels have increased in association with the increased epidemic of obesity, insulin resistance (IR), and T2DM [17,18].
Our study has some important limitations needed to be taken into consideration when interpreted the outcomes of this study. Firstly, the retrospective nature of the study, secondly the smaller number of participants. All these limitations may make this study would not be applied to the general population of similar cohort outside of the hospital. Though, the future studies should focus on determining of the prevalence of such risk factors for CAD maybe in more robust prospective observational studies or Randomized Controlled Trials (RCTs) including a larger number of patients with CAD.
To conclude, in Libyan patients with CAD, we have found that hypertriglyceridemia accounted for the highest prevalence amongst the other risk factors for CAD included in this study namely T2DM, hypertension, and hyperuricemia. T2DM accounted for the second highest prevalence. Further studies are needed to focus in more details on these outcomes maybe in prospective studies in a larger number of patients with established CAD.

Disclaimer

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

Conflict of interest

We declare that we have no competing interests.

Author contributions

All authors contribute equally in this manuscript.

Abbreviations

CAD: Coronary Artery Disease; HyperTG: Hypertriglyceridemia; IR: Insulin Resistance; N (%): Numbers and percentages; RCTs: Randomized Controlled Trials; SPSS: Statistical Package for the Social Sciences; TGs: Triglycerides; T2DM.

Data availability statement

The data can be made available upon request.

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