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Assessment of Lipid Profile Status in Diabetes Mellitus in Iraqi Patients

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Abstract **Introduction:** Diabetes mellitus (DM) greatly burdens health and economic status worldwide. One of the major sequels of DM is its effect on coronary artery disease (CAD) prevalence. DM-associated dyslipidemia is considered one of the hazardous comorbidities as it directly accelerates atherosclerosis, hypertension, and CAD. **Aim of the Study:** This study aimed to assess the lipid profile status among T2DM patients from Iraq. **Subjects and Methods:** The current study randomly selected 100 diabetic patients of equal sex distribution. All included patients were subjected to anthropometric measurements, blood glucose, and lipid profile assessments. **Results:** Among the studied patients, 76 patients were found to have dyslipidemia, while 23 did not show any disturbance in their lipid profiles. Diabetic patient with dyslipidemia had significantly higher BMI compared to the non-dyslipidemia group. There were statistically significant higher levels of PPBS, TG, TC, and LDL cholesterol in patients with diabetic dyslipidemia compared to the other group. Moreover, there were statistically significantly lower HDL cholesterol levels in patients with diabetic dyslipidemia compared to the non-dyslipidemia group. **Conclusion:** DM is directly related to increased serum triacylglycerols, total serum cholesterol, LDL cholesterol, and a decrease in HDL cholesterol.

Key Words DM, Triglycerides, Cholesterol, LDL-C, HDL-C

1. Introduction

Diabetes is a major global health problem. A significant global health issue is diabetes. According to estimates, about 4oo million people all over the world have diabetes, with type 2 diabetes accounting for the bulk of cases [1]. Six nations are listed in the top 10 nations worldwide with the highest prevalence of diabetic patients in the Middle East including Iraq [2].

Globally, Type 2 Diabetes (T2DM) and its associated cardiovascular complications exhibit serious threats to public health. The most common cause of death for those with T2DM is coronary artery disease (CAD), which has a 2-4 fold increased risk in those with the condition [3]. T2DM and associated CAD, which are important modifiable risk factors for dyslipidemia and hypertension, account for over 87% of impairments in low- and middle-income countries [4].

Diabetes individuals with lipid abnormalities, often known as "diabetic dyslipidemia", have high total cholesterol (TC), high triglycerides (TAG), low HDL-cholesterol levels, and elevated amounts of low-density LDL-cholesterol particles [5]. Low-density lipoprotein cholesterol (LDL-cholesterol) levels may be slightly increased or normal. Individuals with type 2 diabetes and prediabetes typically have aberrant lipid levels, but the distribution of these lipids varies based on ethnicity, socioeconomic background, and access to medical care [6]. In addition, studies in individuals with T2DM have discovered a stronger correlation between coronary diseases and high TAG and low HDL-cholesterol when these two lipid parameters are evaluated together [7].

Clinical and public health professionals should pay close attention to the relationship between serum lipid profiles and various degrees of glucose intolerance because this information may one day serve as the foundation for programs to prevent diabetes and its complications [8]. Therefore we conducted the current study to assess the lipid profile status among T2DM patients from Iraq.

2. Subjects and Methodology

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Subjects One hundred previously diagnosed diabetic patients were included in this study aged 28-79 years of both sexes. They were living in Baghdad-Iraq during the period from

January 2022 to March 2022. The study was conducted in a cross-sectional design and done over 3 months. Purpose of the current study was thoroughly explained to each patient and informed consent was obtained. Confidentiality of data was maintained.

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Laboratory Measurements Included patients were subjected to total history taking, anthropometric assessment (height and weight measurement) with calculation of body mass index (BMI) then laboratory assessment of blood glucose, HbA1c and lipid profile. Venous blood samples were obtained from overnight fasting patients to measure fasting plasma sugar. Another three mL of venous blood was withdrawn 2 h after oral ingestion of 75 g glucose. Level of plasma glucose was measured using the glucose oxidase reaction and serum lipids were measured according to standard enzymatic assay reported by the manufacturer. HDL-cholesterol was assessed by directly while LDL-cholesterol was measured using the Friedewald's formula [9].

The criteria for diagnosis of dyslipidemia were according to the American Diabetes Association. Hypercholesterolemia was defined as a Total Cholesterol (TC) level of 200 mg/dl, HDL-cholesterol was defined as low when the level was 40 mg/dl in males and 50 mg/dl in females, LDL-cholesterol was defined as high if it was 100 mg/dl, and Hyper-Triglyceridemia (TG) was defined as a level of 150 mg/dl [9].

Statistical analysis

All data collected were analyzed using SPSS software version 25.0 (SPSS, USA). Analysis of categorical data between groups was done using chi-square test. All p-values were two-sided and values < 0.05 was considered of significance for all tests.

3. Results

All data of the enrolled patients are presented in the Tables 1 and 2 and Figures 1 and 2. The current study included 100 diabetic patients (50 males and 50 females). On assessment of lipid profile parameters, 76 patients were found to have dyslipidemia while 23 didn't (Table 1 and Figures 1 and 2). Diabetic patients with dyslipidemia had statistically significant higher BMI compared to non-dyslipidemia group. Moreover, we detected statistically significant higher levels of PPBS, TG, TC and LDL- cholesterol in diabetic patients with dyslipidemia compared to the non-dyslipidemia patients. Moreover, there was statistically significant lower levels of HDL-cholesterol in diabetic patients with dyslipidemia compared to non-dyslipidemia patients. In Table 1, data was represented as mean $\pm$ standard deviation, comparisons were done using independent T-test, BMI: body mass index, FBS: fasting blood sugar, PPBS: post-prandial blood sugar, TG: triglycerides, TC: total cholesterol, HDL-C: high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol, NS: non-significant, HS: highly-significant.

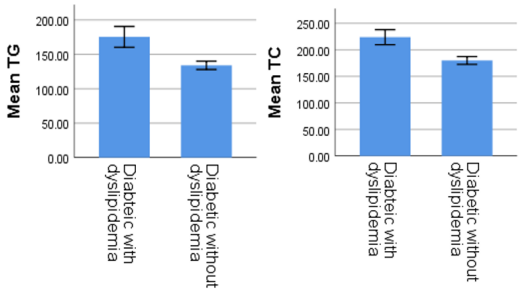

Figure 1: Comparison of mean TG and TC between the two groups

In Table 2, data was represented as p values, correlations were done using Pearson correlation test, BMI: body mass index, FBS: fasting blood sugar, PPBS: post-prandial blood sugar, TG: triglycerides, TC: total cholesterol, HDL-C: high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol, NS: non-significant, HS: highly-significant.

Correlation of BMI and blood glucose levels with lipid profile parameters revealed significantly positive correlation between BMI and HbA1c, TG and TC in diabetic patients with dyslipidemia, while PPBS revealed statistically significant positive correlation LDL-cholesterol. In the diabetic patients without dyslipidemia, there was statistically significant positive correlation between BMI and TC and LDL-cholesterol (Table 2).

4. Discussion

Coronary artery diseases are the leading cause of death worldwide. Guidelines have been issued to control this epidemic [4]. Patients presented with atherosclerosis are at a higher risk than the healthy individuals, and decreasing lipid levels is critical for high-risk populations [10].

Diabetes mellites is a significant risk factor for cardiovascular disease as it accelerates the development of atherosclerotic patches and contributes to pathogenesis of ischemic heart disease prevalence owing to its dyslipidemic effects [11]. The current study aimed to assess the lipid profile status among T2DM patients from Iraq.

Among the studied patients, 76 patients were found to have dyslipidemia while 23 patients didn't show any disturbance in their lipid profiles. TG, TC, HDL- cholesterol and LDL-cholesterol levels were significantly disturbed in diabetic patients with dyslipidemia.

Diabetic dyslipidemia is characterized by elevated TG, decreased HDL- cholesterol, and an increase in LDL- cholesterol [11]. Therefore, it has been reported that dyslipidemia is defined by elevated plasma TG, TC, low HDL-C levels, and increased LDL. Definition of dyslipidemia in any affected individual necessitates abnormal level in at least one of the four parameters of the lipid profile [12].

	Patients with dyslipidemia (no = 76)	Patients without dyslipidemia (no = 23)	P value
Age (years)	44.6 ± 8.9	46.5 ± 7.6	0.432 (NS)
BMI	29.06 ± 3.9	26.85 ± 3.3	0.002 (HS)
FBS (mg/dl)	120.5 ± 24.5	109.9 ± 22.4	0.104 (NS)
PPBS (mg/dl)	211.7 ± 37.5	185.4 ± 21.5	0.012 (S)
HbA1c (%)	6.55 ± 0.29	6.25 ± 0.17	0.141 (NS)
TG (mg/dl)	175.4 ± 21.3	134.5 ± 11.8	<0.001(HS)
TC (mg/dl)	223.8 ± 29.7	179.9 ± 10.3	<0.001(HS)
HDL-C (mg/dl)	36.6 ± 4.3	50.1 ± 4.9	<0.001(HS)
LDL-C (mg/dl)	112.2 ± 19.4	84.5 ± 17.5	<0.001(HS)

Table 1: Anthropometric assessment and laboratory findings of included patients

P value of	Patients with dyslipidemia (no = 76)			Patients without dyslipidemia (no = 23)		
	BMI	FBS	PPBS	BMI	FBS	PPBS
HbA1c	0.009(HS)	0.720(NS)	0.274(NS)	0.197(NS)	0.186(NS)	0.486(NS)
TG	0.006(HS)	0.940(NS)	0.396(NS)	0.208(NS)	0.082(NS)	0.767(NS)
TC	0.047(S)	0.112(NS)	0.940(NS)	0.037(S)	0.400(NS)	0.073(NS)
HDL-C	0.961(NS)	0.274(NS)	0.112(NS)	0.002(HS)	0.743(NS)	0.127(NS)
LDL-C	0.519(NS)	0.818(NS)	0.014(S)	0.562(NS)	0.141(NS)	0.229(NS)

Table 2: Correlation of BMI and blood glucose levels with lipid profile parameters

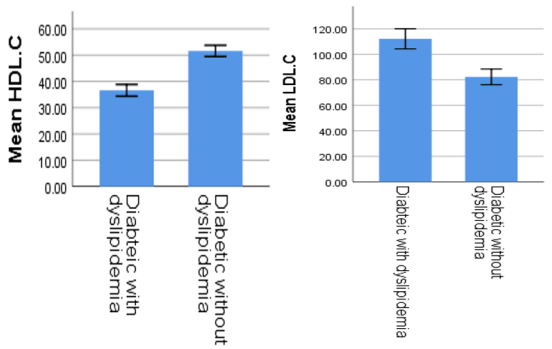

Figure 2: Comparison of mean HDL-C and LDL-C between the two groups

Already recognised as a standalone risk factor for cardiovascular disease, dyslipidemia. Inflammation linked to atherosclerosis is exacerbated and disseminated when dyslipidemia and elevated blood glucose levels are present [13]. Those with newly diagnosed T2DM who are asymptomatic have been shown to have more coronary artery calcification [14]. Studies have revealed a connection between dyslipidemia and T2DM microvascular sequelae include diabetic retinopathy, diabetic nephropathy, and diabetic neuropathy in addition to being a risk factor for macrovascular effects [15].

5. Conclusion

Based on our results we concluded the pivotal role played by diabetic hyperglycemia in disturbing lipid profile in affected patients. The diabetic associated dyslipidemia must be a target for future research as to lessen its effects on diabetic morbidity and mortality.

Conflict of Interest

The authors declare no conflict of interests. All authors read and approved final version of the paper.

Authors Contribution

All authors contributed equally in this paper.

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