Serum Lipid Profiles in Hypertensive Diabetes Mellitus Type 2 Patients

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Abstract

This study was designed to determine the relationship between the levels of lipid profile in diabetes mellitus type 2 and hypertension. Blood samples were collected from patients under 40 years old with diabetes type 2 and suffering from hypertension. Lipid profile was determined enzymaticlly by using kits. Results revealed that the level of cholesterol was significantly increased in diabetic patients with hypertension more than diabetic patients only. Also the level of triglyceride (TG) was significantly higher in patients suffering from diabetes with hypertension than patients suffering from diabetes only. A significant decrease in the level of high density lipoprotein was recorded in diabetes patients who are suffering from hypertension than patients with diabetes only. There was asignificant increase in the level of triglyceride (TG), low density lipoprotein (LDL) and very low density lipoprotein (VLDL) in male than female patients.

Keywords**:** Diabetes mellitus, Hypertension, Lipid profile.

Introduction

Diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction and failure of various organs, especially the eyes, kidneys, nerves, heart and blood vessels, that impose a tremendous burden on individual with diabetes and on the health care system [1].

It is classified on the bases of pathogenic process that leads to hyperglycemia. The tow broad categories of (DM) are designated type one (DM) and type two (DM). Other forms of (DM) are also categorized separately from these two types, and examples include gestational diabetes, congenital diabetes due to genetic defects of insulin secretion, cystic fibrosis-related diabetes, steroid diabetes induced by high doses of glucocorticoids, and several forms monogenic diabetes [2].

Diabetes mellitus and hypertension are common disease that coexist with each other, and constitute the most common risk factors for coronary heart disease (CHD) [3,4]. Hypertension is well known as a common comorbidity in patients with diabetes with its prevalence ranging from 60% to 80% [5]. Hypertension in the diabetic individual markedly increases the risk and accelerates the course of cardiac disease; diabetes mellitus has been known to be associated with lipid disorders and cardiovascular complication. Both diabetes mellitus and hypertension alter lipid and lipoprotein metabolism and increase the risk of coronary artery disease. Patients with hypertension have been shown to be resistant to insulin stimulated glucose uptake and to be both hyperinsulinemic and hypertriglyceridemic compared with matched normotensive control group [6,7].

Diabetes mellitus and hypertension are the most common disease and the frequency of both disease increases with increasing age [8,9] Also diabetes mellitus is associated with a considerably increased cardiovascular risk. The presence of hypertension in the diabetic individual markedly increases morbidity and mortality in hypertension abnormalities may be seen in glucose, insulin, and lipoprotein metabolism, these abnormalities have been found to be present in the first degree relatives of hypertensive patients [10,11]. Diabetes mellitus is a disorder resulting from both genetic predisposition and favoring environmental factors and is a characterized by alteration in the metabolism of carbohydrate, fat and protein, which are caused by a relative or absolute deficiency of insulin secretion and different levels of insulin resistance. In the patients with long–standing diabetes, late complication develop consisting of alterations and failure of various organs (especially the noninsulin-sensitive ones) including the eyes (retinopathy with vision loss), kidneys (nephropathy leading to renal failure), nerves

(peripheral and autonomic neuropathy), heart and blood vessels (precocious and severe cardiovascular, cerebrovascular and peripheral vascular atherosclerosis). Diabetes mellitus includes etiologically and clinically different diseases that have hyperglycemia in common, representing a syndrome rather than a single disease [12].

Diabetes mellitus arises when insufficient insulin produced or when the available insulin does not function correctly. Without insulin the amount of glucose in the blood stream is abnormally high causing unquenchable thirst and frequent urination [6, 7, 13, 14] the body's inability to store or use glucose causes hunger and weight loss.

This type of diabetes usually appears in people over the age of 40, and in this type lipid abnormalities and almost the rule, typical finding are elevation of total cholesterol and VLDL cholesterol and a predominance of small dense LDL [14] .

Insulin resistance is often involved in this process lipid abnormalities in patient with diabetes are likely to play important role in development of atherogenesis. These lipid disorders include not only quantitative but also qualitative abnormalities of lipoproteins which are potentially atherogenic [13].

Type-2 (DM) is associated with cluster of interrelated plasma lipid and lipoprotein (LP) abnormalities that are all recognized as predictors for coronary heart disease, including reduced plasma levels of high density Lipoprotein cholesterol(HDL-C) particles and elevated plasma levels of triglyceride (TG)[15,16].

This study was conducted to investigate the estimate lipid profile in hypertensive type 2 diabetic patients.

Material and Methods

This study included (40) patients with type-2 diabetes mellitus (20-male & 20 female) and (40) hypertensive type-2 diabetic (20- male & 20-female). Five ml of blood was obtained by venepuncture from all subjects using sterilized disposable needles, the lipid profile assay comprising of serum triglycerides (TG) total cholesterol (TC) high density lipoprotein cholesterol (HDLC) were done by the methods based on enzymatic determination according to kits .(Biomericux).

Low density lipoprotein (LDL) as calculated from friedewalde formula. The statistical analysis of data generated from this study was done by computer software statistical package for social sciences (SPSS). The values were expressed as a mean ± standard deviation.

Results

In Table (1) result showed that a significant increase in the level of cholesterol in diabetic and hypertensive diabetic female and male compared to control (163.33± 23.7mg/dl and 189.9+ 6.8 mg/dl **vs**. 151.3+ 6.8 mg/dl) respectively for female and (204.6+28.99 mg/dl and 250.26 + 31.87mg/dl **vs** 158.3 + 11.2 mg/dl) for male respectively. Also, results revealed that the level of cholesterol was significantly higher in male compared with female $p \leq 0.05$.

Table (1)
Serum distribution of cholesterol profile in diabetic and hypertensive diabetic patients according to sex:

Groups / gender	*Total. Chol mg/dl (Mean±SD) Female*	*Total.Chol mg/dl (Mean±SD) Male*
Control	**A,a 151.33±6.81 (n=10)**	**A,a 158.30±11.20 (n=12)**
DM	**B,a 163.33±23.69 (n=20)**	**B,b 204.71±28.99 (n=20)**
DM+hyper	**C,a 189.92±6.80 (n=20)**	**C,b 250.26±31.87 (n=20)**

Different capital letters represent significant difference between patient and healthy control ($P \leq 0.05$) and different small letters represent significant differences between male and female ($P \leq 0.05$).

The level of triglyceride Table (2) was higher in diabetic and hypertensive diabetic female than control (123.19± 39.97 mg/dl and 146.83±63.58 mg/dl *vs.* 82.42±9.42) mg/dl

respectively for female with no significant differences between them.

The level of triglyceride was higher in diabetic and hypertensive diabetic male than control with no significant differences (123.21±45.77 mg/dl and 181.11±77.53 mg/dl **vs** 135.40±16.41 mg/dl) respectively. Moreover results displayed that triglyceride in hypertensive diabetic male was significantly higher than female (181.11±77.5 mg/dl **vs**. 146.83±6.3 mg/dl). No significant differences in the level between diabetic female and male (123.19±39) mg/dl, (123.21±45.77) mg/dl (P≤0.05).

Table (2)
Serum distribution of tryglycerid profile in diabetic and hypertensive diabetic patients according to gender.

Groups / gender	T.G mg/dl (Mean±SD) Female	T.G mg/dl (Mean±SD) Male
Control	**A,a 82.42±9.42 n=10**	**ABb, 135.40±16.41 n=12**
DM	**B,a 123.19±39.97 n=20**	**A,a 123.21±45.77 n=20**
DM+hyper	**B,a 146.83±63.58 n=20**	**B,b 181.11±77.53 n=20**

Different capital letters represent significant difference between patient and healthy control (P≤0.05) and different small letters represent significant differences between male and female (P≤0.05).

In Table (3) the level of HDL was higher in control (56.0±4.3) mg/dl. The level in diabetic and hypertensive diabetic female were (47.33±7.5 mg/dl and 43.83±6.7 mg/dl **vs** 56.0±4.3mg/dl) significantly were higher than control.

The level of HDL in diabetic and hypertensive diabetic male were significantly lower than control (47±5.8mg/dl and 47.52±7.08 mg/dl **vs**. 63.60±5.06 mg/dl) respectively with no significant differences between them. Also, results showed that no significant differences between female and male.(P≤0.05)

Table (3)
Serum distribution of HDL profile in diabetic and hypertensive diabetic patients according to gender.

Groups / gender	HDL mg/dl (Mean±SD) Female	HDL mg/dl (Mean±SD) Male
Control	**A,a 56.000±4.306 (n=10)**	**A,a 63.600±5.060 (n=12)**
DM	**B,a 47.333±7.592 (n=20)**	**B,a 47.000±5.898 (n=20)**
DM+hyper	**B,a 43.833±6.780 (n=20)**	**B,a 47.526±7.082 (n=20)**

Different capital letters represent significant difference between patient and healthy control (P≤0.05) and different small letters represent significant differences between male and female (P≤0.05).

A significant increase in LDL level in diabetic and hypertensive diabetic female compared to control (94±22.94 mg/dl and 111.42±23.2 mg/dl **vs**.. 78.83±9.5 mg/dl) respectively(Table (4)). The level of LDL was significantly higher in male control (66.6±14.25) mg/dl. The level of LDL in diabetic and hypertensive diabetic female was significantly lower compared to control (130.25±70.3 mg/dl 150.26±45.8 mg/dl **vs**. 66.60±14.25 mg/dl) respectively. Results showed that LDL level was significantly higher in male compared to female.

Table (4)
Serum distribution LDL profile in diabetic and hypertensive diabetic patients according to gender.

Groups / gender	LDL mg/dl (Mean±SD) Female	LDL mg/dl (Mean±SD) Male
Control	**A,a 78.83±9.52 (n=10)**	**A,b 66.60±14.25 (n=12)**
DM	**BC,a 94.00±22.49 (n=20)**	**B,b 130.25±70.34 (n=20)**
DM+hyper	**C,a 111.42±23.22 (n=20)**	**B,b 150.26±45.83 (n=20)**

Different capital letters represent significant difference between patient and healthy control (P≤0.05) and different small letters represent significant differences between male and female (P≤0.05).

In Table (5) results showed that the level of VLDL in diabetic and hypertensive diabetic female was significantly higher than control (24.71±8.07 mg/dl and30.75±12.3 mg/dl **vs.** 16.5±1.83 mg/dl) respectively. Moreover, results showed that there were no significant differences in the level of VLDL values between male and female.

Table (5)
Serum distribution VLDL profile in diabetic and hypertensive diabetic patients according to gender.

Groups / gender	*VLDLmg/dl (Mean±SD) Female*	*VLDLmg/dl (Mean±SD) Male*
Control	**A,a 16.500±1.834 (n=10)**	**A,b 27.10±3.31 (n=12)**
DM	**B,a 24.714±8.076 (n=20)**	**A,a 29.00±14.86 (n=20)**
DM+hyper	**B,a 30.750±12.315 (n=20)**	**A,a 33.16±15.28 (n=20)**

Different capital letters represent significant difference between patient and healthy control (P≤0.05) and different small letters represent significant differences between male and female (P≤0.05).

Discussion

The present study comprised of a random sample population, which has been selected on strict criteria based on including non diabetic and volunteers as control. These observed increase and decrease in serum lipid profile associated with diabetes mellitus are in agreement with finding of [17,18and19].

In diabetes, many factors may affect blood lipid level, this is because carbohydrate and lipid metabolisms are interrelated to each other if there is any disorder in carbohydrate metabolism, it also leads to lipid metabolism disorder,so the results revealed that there was a significant increase in lipid profile in diabetic patient, high concentration of cholesterol in type 2 diabetics and hypertensive type 2 diabetic patients (male & female), compared with non-diabetic subjects, LDL-C concentration was higher in type 2 diabetic females than in non-diabetic females HDL-C acts by enhancing the removal cholesterol from the peripheral tissues and so reduces the body's cholesterol pool. Type 2 DM was usually associated with low plasma levels of HDL-C [20].

There were also lower mean of HDL-C concentration in hypertensive type 2 diabetic males and hypertensive type 2 diabetic females, low HDL-C concentrations are often accompanied by elevated TG levels as seen in this study and this combination has been strongly associated with an increase the risk of coronary heart disease (CHD) emphasis has been placed on the importance of combination of high plasma TG and a low HDL-C concentration as a predictor of increasing risk of (CHD) [21,22,23], although plasma HDL-C concentration has not been shown to be consistently decreased in patients with hypertension, there is certainly evidence of the presence of direct and inverse relationships between plasma insulin and TG and HDL-C concentrations, respectively[r].

High TG levels cause increased in transfer of (cholesteryl esters) from HDL-C and LDL-C to very VLDL-C via (cholesteryl ester) transfer protein, thus forming (cholesteryl ester) depleted, small dense LDL-C particles.[r]these small dense lipoprotein particles are taken up by arterial wall macrophages, resulting in atherogenesis, Patients with dibetes tend to be dyslipidemic with high fasting blood glucose, high triglcerid (TG) and high low density lipoprotein (LDL) with decreased high density lipoprotein (HDL). It is well documented that reduced (HDL) levels are associated with an increased risk of coronary heart disease (HDL) (Jessica et.al 2010). A number of function of HDL may contribute to direct cardio protective effects, including promotion of cellular cholesterol efflux and direct anti-oxidative and anti-inflammatory properties.[24]

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الخلاصة

صممت الدراسة الحالية لتحديد العلاقة بين مستوى الدهون لدى مرضى السكري النوع الثاني و ارتفاع ضغط الدم. جمعت نماذج الدم من اشخاص يعانون من مرض السكري النوع الثاني و ارتفاع في ضغط الدم و كانت اعمارهم تحت الاربعين سنة قيست نسبة الدهون لدى المرضى و السيطرة بأستخدام عدة تشخيصية انزيمية متخصصة، اظهرت النتائج ان مستوى الكولسترول قد ارتفع عند مرضى السكري الذين يعانون من ارتفاع في ضغط الدم اكثر من المرضى الذين يعانون من مرض السكري فقط، كذلك لوحظ ارتفاع في مستوى الدهون الثلاثية عند مرضى السكري و الذين يعانون من ارتفاع في ضغط الدم اكثر من المرضى الذين يعانون من مرض السكري فقط. حصل انخفاض معنوي في مستوى الدهون العالية الكثافة عند مرضى السكري و الذين يعانون من ارتفاع في ضغط الدم اكثر من مرضى السكري فقط، اظهرت النتائج زيادة في مستوى الكولسترول، الدهون الثلاثية و كذلك مستوى الدهون ذات الكثافة الواطئة عند الرجال اكثر من النساء.