Evaluation of serum lipid in diabetic patients on different types of treatment

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Abstract

Diabetes mellitus is chronic metabolic disorder which causes many complications. These are subdivided into microvascular complication affecting retina, kidney and peripheral nerves and macrovascular complications (atherosclerosis) affecting the major arterial systems including coronary arteries. Abnormal lipid metabolism is common in DM and it play an important role in the macrovascular complications. In this case control study 150 diabetic patients on different regimens of treatment were investigated for hyperlipidemia and compared to each other and to 50 apparently healthy control.

Comparison of each group of diabetic patients with the control group was as follow; regarding total cholesterol there was no significant difference, triglyceride was significantly higher in group 2 (mixed insulin and oral hypoglycemic therapy), and group 3 (oral hypoglycemic drugs therapy) ($P<0.001$) in comparison with control group, while in group 1 (only insulin therapy) it was lower than the control group, but the difference was statistically not significant, HDL was significantly lower in all groups in comparison with control group and the least value of HDL was found in group 3 ($P<0.001$). Regarding LDL there was no significant difference in comparison with the control group, while VLDL was higher in group 2 and 3 than the control group and the difference was significant ($P<0.001$). Comparison of the measured parameters among three groups of diabetic patients was as follow; regarding total cholesterol and LDL there was no significant difference among these three groups. Triglycerides and VLDL were significantly lower in group 1 ($P<0.001$), while HDL was significantly lower in group 3 ($P< 0.001$). Cholesterol, triglycerides and VLDL were significantly higher in females in group 2 ($P<0.05$). Regarding HDL and LDL no significant difference was found between males and females. In group 1 triglyceride was higher in those with 5 – 10 years treatment, while in group 2 & 3 there was no significant difference in measured parameters regarding the duration of treatment.

تقييم نسبة دهون الدم لمرضى داء السكر المعالجين بمختلف أنواع العلاج

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المستخلص

داء السكر مرض مزمن يؤدي إلى مضاعفات كثيرة تشمل إصابة شبكية العين والكلية والأعصاب بالإضافة إلى ارتفاع نسبة دهون الدم الذي يسبب تصلب الشرايين.

هذه الدراسة شملت 150 مريضا بداء السكر { 50 منهم على علاج الأنسولين (مجموعة 1) و 50 على الأقراص الخافضة للسكر(مجموعة 2) و 50 على كلا النوعين من العلاج (مجموعة 3)} وقد اجريت التحاليل الخاصة بنسبة الدهون لجميع المرضى وقورنت النتائج بين هذه المجاميع الثلاثة و مع 50 شخصا من الأصحاء. أظهرت النتائج انه لا توجد فروقات إحصائية في نسبة كوليستيرول الدم (Cholesterol) والدهون قليلة الكثافة (LDL) بين هذه المجاميع الثلاثة والأصحاء، بينما كانت نسبة والترايكليسيرايد (triglyceride) اعلى لدى مرضى المجموعتين 2 و 3 واقل في المجموعة 1 مقارنة مع الأشخاص الأصحاء، و كانت نسبة الدهون عالية الكثافة (HDL) اقل لدى جميع المرضى ، أما نسبة الدهون ذات الكثافة الواطئة جدا (VLDL)فكانت اعلى لدى مرضى المجموعين 2 و 3 مقارنة مع الأشخاص الأصحاء.

أظهرت المقارنة بين مجاميع المرضى انه لا توجد فروقات احصائية في نسبة الكوليستيرول (Cholesterol) والدهون قليلة الكثافة بين هذه المجاميع الثلاثة ، بينما كانت نسبة والترايكليسيرايد (triglyceride) و الدهون ذات الكثافة الواطئة جدا (VLDL) اقل في المجموعة 1 ، أما نسبة الدهون عالية الكثافة (HDL) فكانت اقل في المجموعة 3 .

كانت نسبة الكوليستيرول(Cholesterol) والترايكليسيرايد (triglyceride) والدهون ذات الكثافة الواطئة جدا اعلى لدى الإناث في المجموعة 2 بينما لا توجد فروقات إحصائية في نسبة الدهون عالية الكثافة (HDL) و الدهون ذات الكثافة الواطئة (LDL) بين الذكور والإناث.

نسبة و والترايكليسيرايد (triglyceride) كانت اعلى لدى مرضى المجموعة 1 الذين مضى على مرضهم فترة 5 – 10 سنوات.

Introduction

Diabetes mellitus (DM) is one of the most widely distributed metabolic disorders which occurs in almost all populations of the world at a variable prevalence [1]. DM is characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defect in insulin secretion, insulin action or both [2].

Diabetes mellitus can be divided into three subclasses [3]:

1- Type I or insulin dependent diabetes mellitus (IDDM).

2- Type II or non-insulin dependent diabetes mellitus (NIDDM).

3- Secondary diabetes associated with another identifiable condition or syndrome as pancreatic diseases, endocrine disease, drugs and genetic disorders.

Diabetes mellitus is chronic disorder which causes many complications. These are subdivided into microvascular complication, affecting microvascular circulation: retina, kidney and peripheral nerves and macrovascular complications (atherosclerosis) affecting the major arterial systems including coronary arteries[4]. Abnormal lipid metabolism (Dyslipidemia) in DM play an important role in the macrovascular complications. Dyslipidaemia is a common complication of DM, as both insulin deficiency and insulin resistance affect enzymes and pathways of lipid metabolism because insulin availability appears to be necessary for normal function of lipoprotein lipase[5,6]. Patients with type II diabetes are particularly prone to dyslipidaemia, the major causes of morbidity and mortality in patients with type II diabetes are macrovascular complications, notably coronary heart disease, and dyslipidaemia plays an important role in the pathogenesis of these complications [7,8].

Treatment of diabetes mellitus involves changes in lifestyle and pharmacological intervention with insulin or oral glucose-lowering drugs. In type I diabetes, the primary focus is to replace insulin secretion, while changes in lifestyle are the cornerstone of treatment for most patients with type II diabetes. The treatment goals are divided into short term goals to restore the metabolic control and long term goals to minimize the complications, although therapeutic strategies for the two forms of diabetes differ, but the short term and long term goals of treatment are identical [3].

Oral hypoglycemic drugs include[9,10,11]:

1- Sulphonylureas.
2- Biguanides.
3- α-Glucosidase Inhibitors.
4- Thiazolidinediones.
5- Repaglinide.

The aim of the this study is to find the relation between serum lipid profile and type of treatment in diabetes mellitus.

Patients and Methods

This study is a case control study. It was conducted on 150 diabetic patients of both sexes, 87 (58%) were male and 63 (42%) were female. The study was conducted in Tikrit Teaching Hospital during the period from November 2003 to the June 2005. All the patient who take other drugs in addition to insulin and/or hypoglycaemic agents or having history of other diseases which may interfere with the results were excluded from the study .

Patients were divided into 3 groups:-

Group 1: Fifty diabetic patients on only insulin therapy, 29 (58%) patients were male whose ages ranged from 15-60 years (mean 35.7±16.8) and 21 (42%) patients were female whose ages ranged from 15-65 years (mean 39.8±14.2).

Group 2: Fifty diabetic patients on oral hypoglycemic therapy, 45 (90%) patients were on sulphonylureas, 27 (60%) of them were male whose ages ranged from 27-70 years, mean (47.6±11.6) and 18 (40%) were female whose ages ranged from 30-65 years (mean 49.7±9.6). Five (10%) patients were on metformin therapy, all were males whose ages ranged from 41-60 years (mean 49.6±7.7)..

Group 3: Fifty diabetic patients on combination of insulin and oral hypoglycemic agents therapy, 26 (52%)

patients were male whose aged ranged from 30-60 years (mean 47.4±8.75) and 24 (48%) patients were females whose ages ranged from 45-60 years (mean (51.7±5.18) . Fifty adults were used as controls, 22 (44%) were males with age range from 21-70 years (mean 37.3±15.7), 28(56%) were females in the age range from 23-55 years (mean 33.5+14.4) .This groups consist of apparently healthy individuals who were selected from two different sources; apparently healthy individuals who accompanied the patients and student of College of Medicine

Fasting blood samples were obtained from all patients and control group between 9 – 11 a.m after 12 hrs fasting. Sera were used for enzymatic spectrophotometric estimation of the total cholesterol, triglycerides, HDL, LDL and VLDL- cholesterol in addition to blood sugar.

Results

Table (1) show a comparison of the mean values of lipid profile between the control group and the groups of diabetic patients. Regarding the total cholesterol there was no significant difference, triglyceride was significantly higher in group 2 (mixed therapy) and group 3 (oral hypoglycemic drugs therapy) ($P<0.001$) in comparison with control group, while in group 1 (only insulin therapy) it was lower than the control group, but the difference was statistically not significant, HDL was significantly lower in all groups in comparison with control group and the least value of HDL was found in group 3 ($P<0.001$). Regarding LDL there was no significant difference in comparison with the control group, while VLDL was higher in group 2 and 3 than the control group and the difference was significant ($P<0.001$). Comparison of the measured parameters among three groups of diabetic patients show that total cholesterol and LDL there was no significant difference among these three groups. Triglycerides and VLDL were significantly lower in group 1 ($P<0.001$), while HDL was significantly lower in group 3 ($P< 0.001$).

Table (2) represents the difference in the measured parameters between the different groups according to the sex. Cholesterol, triglycerides and VLDL were significantly higher in females in group 2 ($P<0.05$). Regarding HDL and LDL no significant difference was found between males and females.

Table (3), (4) and (5) show the effect of duration of treatment on the measured parameters in group 1, 2 & 3 respectively. In group 1 triglyceride was higher in those with 5 – 10 years treatment, while in group 2 & 3 there was no significant difference in measured parameters regarding the duration of treatment.

Discussion

The pattern of dyslipidemia seen in diabetes is different from that in non diabetic population. This fact explains the importance of lipid and lipoprotein investigation in diabetics and suggest a different lipid lowering agents from that used in non-diabetic population [12].The metabolic disorder of serum lipid in carbohydrate intolerance may be related to the type of diabetes, its treatment, duration and the degree of control [13].The pattern of dyslipidemia of diabetics in this study was combined hyperlipidemia (hypertrighyceridemia with low HDL), which agree with that reported by other studies [14,15].

Regarding total cholesterol and LDL measurement , the results are in agreement with that reported by [16] and [17], who stated that no significant difference in total cholesterol and LDL-C was found between diabetic and non-diabetic individuals. Abdul-Razzak and Mulla Abid [15] stated that although the triglycerides and cholesterol are significantly higher in diabetics, the elevation in serum triglycerides was more evident than in serum cholesterol and a comparable results were also obtained by[18] and [19], who reported markedly elevated triglycerides with normal or slightly elevated cholesterol in diabetic patients. In insulin dependent diabetic patients chylomicrons and VLDL catabolism occurs as a direct consequence of reduced lipoprotein lipase activity due to insulin deficiency since the enzyme requires insulin for its activation and

this will lead to Fridrickson's type I, IV or V pattern of dyslipoproteinaemia, while in type II diabetics, with insulin resistance, the condition result in hyperinsulinaemia which accentuates hepatic production of triglycerides and its main carrying lipoprotein VLDL [20]. Several epidemiological studies have shown that elevated LDL-C and triglyceride levels and decreased HDL-C concentrations which frequently occur in diabetic patients treated by oral hypoglycemic agents increase the risk of ischemic heart diseases in those patients [21]. In a longitudinal study of hyperlipidemia in diabetic patients which was conduced in Mosul by [22] the mean serum cholesterol and LDL-C were significantly higher in both types of DM in contrast to the result of this study probably because this study was not prospective.

No significant difference was observed in serum VLDL-C and triglyceride in diabetics on only insulin therapy compared with the control group, while a significant difference was observed in the same parameters in diabetic patients on oral hypoglycemic agents compared with the control group, this is because the patients on only insulin therapy were younger and the duration of the disease was shorter. The increment in serum lipid profile was more obvious for triglyceride than cholesterol particularly in diabetic patients on oral hypoglycemic agents, this agrees with modern trend on syndrome X [23].

Total cholesterol, triglyceride and VLDL were higher in females on oral hypoglycemic drugs. Triglyceride was higher in those on only insulin therapy for 5 – 10 years. These are in agreement with that reported by[21], who stated that the frequency of abnormality of lipids varies in different populations and the lipid levels are affected by age, sex, life style , dietary habits , physical activities , obesity , hypertension , smoking , contraceptive use and certain genetic predisposing factors. Many diabetic patients develop complications as ischemic heart diseases, hypertension and diabetic nephropathy after 10 years from the onset of diabetes mellitus and they receive other treatments, so they were excluded from this study, that is why some lipid values appeared to be higher in those who were diabetic for 5 – 10 years than those who were diabetic for more than 10 years.

Conclusions

1-Triglyceride was significantly higher in diabetic patients on only oral hypoglycemic and mixed insulin and oral hypoglycemic therapy in comparison with control group, while in group 1 (only insulin therapy) it was lower than the control group, but the difference was statistically not significant.

2-HDL was significantly lower in all groups of diabetic patients in comparison with control group.

3-VLDL was higher in diabetic patients on only oral hypoglycemic and mixed insulin and oral hypoglycemic therapy than the control group and the difference was statistically significant ($P<0.001$).

4-Triglycerides and VLDL were significantly lower in those on only insulin therapy ($P<0.001$), while HDL was significantly lower in those on mixed therapy ($P< 0.001$) in comparison to other groups of diabetic patients.

5-Cholesterol, triglycerides and VLDL were significantly higher in females in group 2 (only oral hypoglycemic therapy ($P<0.05$), while no significant difference was found in the level of HDL and LDL between males and females.

Table (1): Comparison of measured parameters between control and diabetic patients on different therapies.

Parameters	Control	Group 1	Group 2	Group 3	P value
Cholesterol (mmol/L)	5.15 ± 1.33	4.91 ± 1.42	5.27 ± 1.33	5.04 ± 1.16	P>0.05
TG (mmol/L)*	1.69 ± 0.84	1.56 ± 1.15	2.45 ± 0.92	2.36 ± 0.96	P<0.001
HDL (mmol/L)**	1.22 ± 0.34	0.94 ± 0.30	0.96 ± 0.35	0.68 ± 0.19	P<0.001
LDL (mmol/L)	3.16 ± 1.29	3.25 ± 1.12	3.19 ± 1.25	3.26 ± 1.14	P>0.05
VLDL (mmol/L)*	0.76 ± 0.38	0.71 ± 0.52	1.10 ± 0.41	1.07 ± 0.44	P<0.001

*TG and VLDL were significantly lower in group 1 than group 2 and 3 of diabetic patients (p<0.001).

** HDL was significantly lower in group 3 than group 1and 2 of diabetic patients (p<0.001).

Table (2): Comparison of measured parameters among diabetic patients on different therapies according to the sex

Parameters	Sex	Group 1		Group 2		Group 3	
		Mean ± SD	P value	Mean ± SD	P value	Mean ±SD	P value
Cholesterol (mmol/L)	M	5.12 ± 1.48	P>0.05	4.57 ± 1.29	P<0.05	4.90 ± 1.27	P>0.05
	F	5.43 ± 1.15		5.37 ± 1.49		5.30 ± 0.90	
TG (mmo/L)	M	2.30 ± 1.03	P>0.05	1.26 ± 0.99	P<0.05	2.30 ± 0.92	P>0.05
	F	2.62 ± 0.77		1.99 ± 1.25		2.48 ± 1.03	
HDL (mmol/L)	M	0.88 ± 0.34	P>0.05	0.97 ± 0.28	P>0.05	0.69 ± 0.20	P>0.05
	F	1.05 ± 0.34		0.90 ± 0.34		0.67 ± 0.17	
LDL (mmol/L)	M	3.19 ± 1.35	P>0.05	3.02 ± 1.09	P>0.05	3.13 ± 1.26	P>0.05
	F	3.18 ± 1.16		3.56 ± 1.10		3.49 ± 0.85	
VLDL (mmol/L)	M	1.02 ± 0.45	P>0.05	0.57 ± 0.45	P<0.05	1.04 ± 0.42	P>0.05
	F	1.19 ± 0.35		0.90 ± 0.57		1.12 ± 0.47	

Table(3): The effect of duration of therapy on the measured parameters for group 1

Parameter	Duration (year)			P Value
	<5	5-10	>10 years	
Cholesterol (mmol/L)	4.90 ± 1.54	5.21 ± 1.62	4.76 ± 1.17	P>0.05
TG (mmo/L)	1.16 ± 0.99	2.05 ± 1.35	1.88 ± 1.12	P<0.05
HDL (mmol/L)	0.98 ± 0.29	1.00 ± 0.40	0.84 ± 0.26	P>0.05
LDL (mmol/L)	3.38 ± 1.18	3.27 ± 1.26	3.06 ± 0.98	P>0.05
VLDL (mmol/L)	0.53 ± 0.45	0.93 ± 0.62	0.85 ± 0.51	P>0.05

Table (4): The effect of duration of therapy on the measured parameters for group 2

Parameter	Duration (year)			P Value
	<5	5-10	>10 years	
Cholesterol (mmol/L)	5.08 ± 1.21	5.16 ± 1.35	5.75 ± 1.44	P>0.05
TG (mmo/L)	2.23 ± 0.91	2.50 ± 0.97	2.67 ± 0.83	P>0.05
HDL (mmol/L)	0.97 ± 0.38	0.93 ± 0.32	1.02 ± 0.37	P>0.05
LDL (mmol/L)	3.09 ± 1.08	3.09 ± 1.29	3.51 ± 1.46	P>0.05
VLDL (mmol/L)	1.01 ± 0.41	1.11 ± 0.43	1.21 ± 0.38	P>0.05

Table (5): The effect of duration of therapy on the measured parameters for group 3

Parameter	Duration (year)			P Value
	<5	5-10	>10	
Cholesterol (mmol/L)	5.16 ± 1.10	4.99 ± 1.22	4.80 ± 1.28	P>0.05
TG (mmo/L)	2.54 ± 0.98	2.10 ± 0.84	2.37 ± 1.09	P>0.05
HDL (mmol/L)	0.70 ± 0.22	0.70 ± 0.12	0.60 ± 0.19	P>0.05
LDL (mmol/L)	3.28 ± 1.09	3.29 ± 1.16	3.12 ± 1.32	P>0.05
VLDL (mmol/L)	1.15 ± 0.45	0.95 ± 0.38	1.07 ± 0.50	P>0.05

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