

Evaluation of lipid profile in patients with type II diabetes mellitus on different treatment

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Abstract

This study was conducted to investigate and evaluate the level of serum lipid profile in type II diabetic patients with different treatment by measuring the level of total cholesterol, triglycerides, LDL cholesterol, HDL cholesterol, fasting plasma glucose and to compare them with the level of non-diabetic and normotensive volunteers selected as control (group 1). Methods: This study included (64) patients with type II diabetes, and (12) healthy control subjects (group 1). Patients were divided into 4 groups according to their treatment: group 2 (n=12) diabetic patients on diet therapy only; group 3 (n=16) patients on combined treatment with insulin and metformin, group 4 (n=18) patients on daonil only, group 5 (n=18) on insulin only. Blood samples were obtained from all diabetic patients and control subjects after overnight fasting (14-16 hrs) and serum lipid profile, fasting plasma glucose were done for the patients and control. Weight, height & body mass index were calculated according to the equation $\text{weight in kg}/(\text{height})^2$ in meter. Result; The result revealed that serum total cholesterol, was significantly raised in diabetic subjects as compared to control. There was no significant difference in serum LDL cholesterol, and serum TG between group 1 and 3, also no significant difference in serum LDL cholesterol, between group 1 and 5. Conclusion: It was concluded that the efficacy of the administration of metformin and insulin simultaneously without negative effects. No changes in serum HDL-C. Thus, early diagnosis and treatment of dyslipidemia can be used as a preventive measure for the development of cardiovascular disease in type 2 diabetes.

Key word: Diabetes Mellitus, Dyslipidemia

الملخص

الهدف: إنّ هدف الدراسة هو تقييم مستوى واجهة الشحوم في مصل الدم لدى مرضى السكري من نوع 2 والذين يستخدمون انواع مختلفة من العلاجات وذلك بقياس مستوى الكوليستيرول الكلي، الشحوم الثلاثية، الشحوم الدهنية عالي الكثافة، الشحوم الدهنية واطئة الكثافة، والكلوكوز ومقارنتهم مع فحوصات المتطوعين الاصحاء بمجموعة السيطرة (المجموعة 1). **الطرق:** تتضمن الدراسة اربع وستون مريض مصاب بداء السكري نوع 2، و اثنا عشر شخص من الاصحاء ظاهرياً من نفس مدي العمر وهي مجموعة الضبط. قسم المرضى إلى 4 مجموعات طبقاً لمعالجتهم: مجموعة 2 (n=12) مرضى بالسكر على العلاج الغذائي فقط؛ مجموعة 3 (n=16) مرضى على المعالجة المشتركة بالانسولين والمتفورمين، مجموعة 4 (n=18) مرضى على الداونيل فقط، و مجموعة 5 (n=18) على الأنسولين فقط. تم اخذ عينات الدم من كل المجاميع بعد صوم (14-16 ساعات) وتم فحص الدهون في مصل الدم والكلوكوز في البلازما، تم قياس الوزن، الطول و كتلة الجسم حسب المعادلة $\text{الوزن بالكيلوغرام} / (\text{الطول بالمتر})^2$. **النتيجة:** لوحظ بأن هناك ارتفاع ملحوظ في الكوليستيرول الكلي في مرضى السكري مقارنة مع مجموعة الضبط. لا يوجد فرق معنوي في فحص الشحوم الدهنية واطئة الكثافة، والشحوم الثلاثية بين مجموعة 1 و3، أيضاً لا يوجد فرق معنوي في فحص الشحوم الدهنية واطئة الكثافة، بين مجموعة 1 و5. **الاستنتاج:** استخدام الانسولين والمتفورمين لا يحدث تأثير سلبي على الدهون في الدم.

مفتاح الكلمات: داء السكري، ارتفاع الدهون في الدم

Introduction

Diabetes mellitus (DM) is a multifactorial disease which is characterized by hyperglycaemia, lipoprotein abnormalities (1) and altered intermediary metabolism of major food substrates (2). There are probably 100 million people in the world with diabetes mellitus and incidences of diabetes are on the rise (3).

Diabetes mellitus arises when insufficient insulin is 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. The body's inability to store or use glucose causes hunger and weight loss (4).

There are two main types of diabetes. Insulin-dependent diabetes – type 1 diabetes – occurs when there is a severe lack of insulin due to the destruction of most or all of the beta cells in the islets of Langerhans. This type of diabetes develops rapidly, usually appearing before the age of 35, and most often between the ages of 10 and 16 years. Type 2 diabetes– occurs when the body does not produce enough insulin, and the insulin that is

produced becomes less effective. This type of diabetes usually appears in people over the age of 40, and tends to have a more gradual onset (5).

Insulin deficiency causes excessive metabolism of free fatty acids, this may lead to a disorder in lipid metabolism (6). A low level of serum HDL-C is a key feature of type 2 diabetes . Diabetes being one of the strongest risk factors with associated age adjusted risk ratios of about 2.2 for men and about 3.7 for women(7). An increase in body fat leads to less action of insulin as well increases several other toxic substances in the body. Changes occurring in diabetic dyslipidaemia include quantitative and qualitative changes. Quantitative changes include increase in VLDL as compared to normal due to increase availability of glucose for VLDL synthesis and decrease in lipoprotein lipase activity leading to decrease of VLDL from peripheral circulation, increase in LDL-C levels and decrease in HDL-C levels due to increase in hepatic lipase activity decrease in VLDL clearance. Qualitative changes include increase amount of triglycerides, LDL-C and HDL-C, non enzymatic glycation of LDL and non

enzymatic glycation of HDL, thus increasing risk of heart diseases. (8).

Materials and Methods

This study was conducted from March 2011 to July 2012 in Mosul. A total of 76 samples were taken to assess the lipid profile in diabetes mellitus group. Samples of normal individuals which served as controls (group 1: n=12) were evaluated for their lipid profile and plasma glucose. Patients were divided into 4 groups according to their treatment :group 2 (n=12) diabetic patients on diet therapy only; group 3 (n=16) patients on combined treatment with insulin and metformine ,group 4 (n=18) patients on daonil only, group 5 (n=18) on insulin only.

Age group in both diabetics and controls were taken from 35-70 years. The height, weight, body mass index, with lipid profile components were measured. BMI was calculated as weight (in kgs) divided by height (in meters) squared as indicated by the World Health Organization (WHO)(2). Venous blood samples were taken from all the subjects after overnight fasting. Fasting plasma glucose was measured by colorimetric assay using a kit from "GIESSE", Dignostik CAT(9)

, total cholesterol measured by colorimetric assay using a kit from bioMerieux (France) (10), triglycerides measured by colorimetric assay using a kit from bioMerieux (France) (11), High Density Lipoprotein- Cholesterol (HDL-C) measured by colorimetric assay using a kit from bioMerieux (France) (12), Low Density Lipoprotein (LDL) calculated by equation :

$$\text{LDL} = \text{total cholesterol} - \text{HDL} - (\text{TG}/5) \quad (13).$$

Results

Using t-test for comparing between group 1 and 2 there were significant differences between the two groups concerning FPG,TCH, LDL cholesterol, and TG, table 2.

Table 3 shows different parameters measured in the present study, there were significant differences between patients in group 1 and 3 concerning the FPG, and TCH.

The present study reported that there were significant differences between patients in group 1 and 4 concerning the FPG, TCH, LDL cholesterol, and TG.

The present study reported that there were significant differences between patients in group 1 and 5 concerning the FPG, TCH, and TG.

Table 6: Comparison between the groups with each other using Duncan test. Shows differences in FPG, TCH, and TG between the groups.

Discussion

This study demonstrated that dyslipidemia exists in the type 2 diabetic population. There were significant increase in the level of TCH, in all groups of DM when compared with that of control, also increase in the level of TG, LDL although it is not significant in all groups. HDL cholesterol shows lower concentration in all groups of DM but it is not significant. This was in agreement with Gordon et. al (14).

In diabetes many factors may affect blood lipid levels, this is because carbohydrates and lipid metabolism are interrelated to each other if there is any disorder in carbohydrate metabolism it also leads disorder in lipid metabolism so there is high concentration of cholesterol and triglycerides and due to this there is

reduction in HDL cholesterol levels (15).

This study showed that there were no significant difference in the level of LDL and TG between group 1 and 3, and in LDL between group 1 and 5. the level of HDL were higher in group 3 and 5 than group 2 and 4 although it was not significant. Total cholesterol were lower in group 3 and 5 from that in group 2 and 4 although it was not significant. Wulffele et al who shows discrepant results about the influence of metformin on lipid profile (16). Some studies, in agreement with ours, reported reduction only in TC levels (17, 18), while others reported reduction of TC and TG with an increase of HDL-C (19,20). Still other studies showed no changes in lipid profile (21, 22). Another investigation showed an association of metformin with an improvement in the lipid profile even in non-diabetic patients (23).

Conclusion :

lipid profiling for all persons with type 2 DM should be a routine test. All persons with type 2 diabetes must be started on primary prevention by encouraging healthy lifestyle diets so as to reduce the risk of CHD and atherosclerosis.

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Table 1: anthropometric measurement of the studied groups

Parameters Groups	No.	Weight Kg meam±SD	Height M meam±SD	BMI Kg/m² meam±SD
Control) group 1(12	77.17± 11.9	1.64± 0.11	29.06±5.99
Group 2 (DM on diet)	12	84.25± 15.9	1.65±0.69	30.54±5.84
Group 3 (DM on metformin+insulin)	16	84.06±9.96	1.61±0.68	32.55± 4.94
Group 4 (DM on daonil)	18	75.89±14.43	1.62±0.99	28.54±4.66
Group 5 (DM on insulin)	18	79.89±11.06	1.69±0.123	28.29±4.67

Table 2 : comparison between group 1 and 2

Parameters	Groups	Mean	SD	media n	range	*p- value
FPG mg/dl	Group 1	92.52	11.9	92.5	67-107	0.000
	Group 2	232.46	71.30	229.5	130-400	
TCH mg/dl	Group 1	169.67	30.12	180	102-200	0.002
	Group 2	229.58	59.04	226.5	117-339	
HDL mg/dl	Group 1	38.68	11.2	38	25-66	0.12 NS
	Group 2	43.9	10.6	41	28-63	
LDL mg/dl	Group 1	101.5	31.34	103	50-150	0.045
	Group 2	136.32	61.4	136.6	75-237	
TG mg/dl	Group 1	158.42	22.07	159	125-193	0.000
	Group 2	211.68	37.7	225	157-269	

*Student t-test . NS not significant

Table (3): comparison between group 1 and 3 in mean, median minimum and maximum of parameters reported by the present study.

Parameters	Groups	Mean	SD	media n	range	*p-value
FPG mg/dl	Group 1	92.52	11.9	92.5	67-107	0.002
	Group 3	135.42	40.22	122.5	90-230	
TCH mg/dl	Group 1	169.67	30.12	180	102-200	0.02
	Group 3	206.7	54.1	201.5	118-319	
HDL mg/dl	Group 1	38.68	11.2	38	25-66	0.13 NS
	Group 3	43.36	10.01	41	31-76	
LDL mg/dl	Group 1	101.5	31.34	103	50-150	0.07 NS
	Group 3	129.19	47.34	130	32-229	
TG mg/dl	Group 1	158.42	22.07	159	125-193	0.09 NS
	Group 3	178.69	39.2	182	130-270	

*Student t-test . NS not significant

Table (4): comparison between group 1 and 4 in Mean, median minimum and maximum of parameters reported by the present study.

Parameters	Groups	Mean	SD	media n	range	*p-value
FPG mg/dl	Group 1	92.52	11.9	92.5	67-107	0.000
	Group 4	219.7	98.3	203	117-460	
TCH mg/dl	Group 1	169.67	30.12	180	102-200	0.03
	Group 4	214.3	73.9	202.5	129-382	
HDL mg/dl	Group 1	38.68	11.2	38	25-66	0.053 NS
	Group 4	49.06	16.86	45.5	22-77	
LDL mg/dl	Group 1	101.5	31.34	103	50-150	0.04
	Group 4	139.8	67.3	135.5	24-270	
TG mg/dl	Group 1	158.42	22.07	159	125-193	0.03
	Group 4	190.2	52.05	191.5	97-266	

*Student t-test . NS not significant

Table (5): comparison between group 1 and 5 in mean, median minimum and maximum of parameters reported by the present study.

Parameters	Groups	Mean	SD	media n	range	*p-value
FPG mg/dl	Group 1	92.52	11.9	92.5	67-107	0.000
	Group 5	181.1	53.3	175.5	100- 305	
TCH mg/dl	Group 1	169.67	30.12	180	102-200	0.01
	Group 5	203.3	42.03	196	125-287	
HDL mg/dl	Group 1	38.68	11.2	38	25-66	0.057 NS
	Group 5	49.13	17.5	44	26-88	
LDL mg/dl	Group 1	101.5	31.34	103	50-150	0.2 NS
	Group 5	116.06	37.6	118	52-190	
TG mg/dl	Group 1	158.42	22.07	159	125-193	0.003
	Group 5	194.7	39.7	196.5	135-290	

*Student t-test . NS not significant

Table 6: Comparison between the groups with each other using Duncan test.

Parameters	Group2 N=12 mean±SE	Group3 N=16 mean±SE	Group 4 N=18 mean±SE	Group 5 N=18 mean±SE
Weight kg	84.25±4.58 a	84.06± 2.48 a	75.89±3.4 a	79.89±2.6 a
Height m	1.65±0.02a	1.61±0.01 a	1.62± 0.02 a	1.69±0.02 a
BMI Kg/m ²	30.54±1.68 a,b	32.55±1.23 b	28.54±1.09 a,b	28.29±1.1 a
FBS mg/dl	232.46±11.61 c	135.42±17.8 a,b	219.73±23.18 c,d	181.11±12.5 b,c
TCH mg/dl	229.58± 17.04 b	206.76±13.5 a,b	214.33±17.4 b	203.31±9.9 a,b
LDL mg/dl	136.32±3.05 a	129.19±2.5 a	139.83±3.9 a	116.06±4.14 a
HDL mg/dl	43.9± 17.7 a	43.36± 11.8 a	49.06± 15.8 a	49.13±8.87 a
TG mg/dl	211.68±10.8 c	178.69±9.8 a,b	190.19± 12.3 b,c	194.78±9.28 b,c

Different letters horizontally mean significant difference at (p ≤0.05).