Serum Lipid Profile In Type 2 Diabetes Mellitus In Male and Females: More Atherogenic Lipid Profile In Postmenopausal females.

Rasha S. Nema Maha A. AL-kadhum Bassim M. Ali

Department of Chemistry ,Collage of Science, University of Kufa

Abstract:

In the present study we evaluated serum lipids profiles alteration in the type 2 diabetic males and females with fair to good controls, in addition we compared the level of serum lipid profiles in diabetic males with that of diabetic females, and the level of serum lipid profiles in diabetic premenopausal with that of their diabetic postmenopausal counter parts. To achieve this aim, 112 type 2 diabetic patients and 100 age matched healthy individuals with normal glucose tolerance test (control groups) including in this study. These patients and controls subject were classified as male(58 patients ,50 controls), females (54 patients ,50 controls) . Females then subdivided into premenopausal females(27 patients ,25 controls) and postmenopausal females(27 patients ,25 controls) .Body mass index and clinical tests including serum lipoproteins were measured for patients and controls. The results revealed significant ($p<0.001$) elevation of serum total cholesterol, triglycerides ,LDL- cholesterol , VLDL- cholesterol , except HDL-cholesterol which is decreased significantly ($p<0.001$), in all diabetic patients when compared with those of control groups. Females patients had higher level ($p<0.05$), of BMI , total cholesterol triglycerides, LDL-cholesterol, VLDL-cholesterol and low HDL- cholesterol ($p<0.05$), compared to age matched male patients. However, there was no significant difference in the total cholesterol and the triglycerides between the diabetic premenopausal ,and postmenopausal females ($P>0.05$). and a significant reduction in the level of HDL –cholesterol and VLDL-cholesterol in the postmenopausal group, and significant increase in the vale of LDL- cholesterol($P<0.05$).The results pointed out, that the sex was not an independent risk factor for hyperlipidemia,in addition, diabetic postmenopausal females are more prone for hyperlipidemia than diabetic premenopausal females, consequently they are more prone of developing Cardiovascular diseases.

Introduction:

Diabetes is a group of metabolic diseases with characteristic hyperglycemia associated with defects in insulin secretion, insulin action, on both. Type 1 diabetes (formerly known as insulin-dependent diabetes) is characterized by beta cell destruction, usually leading to absolute insulin deficiency. Its etiology is either immune mediated, related to physical destruction of the pancreas (as in pancreatitis or pancreatic cancer) or idiopathic. Type 2 diabetes presents as a spectrum of metabolic abnormalities with prominent insulin resistance and relative insulin deficiency. The effect of diabetes is not limited to carbohydrate metabolism. Lipid and protein metabolism play an important role in the progression of the disease [1].Most common disorders of lipids and lipoproteins metabolism are associated with hyperlipidemia .Very rare congenital disorders may be involved in the accumulation of lipids in tissues not in blood [2]. Lipid and lipoprotein abnormalities are extremely common in the general population, and are regarded as a highly modifiable risk factor for cardiovascular disease due to the influence of cholesterol, one of the most clinically relevant lipid substances, on atherosclerosis. In, addition, some forms may predispose to acute pancreatitis. The risk of cardiovascular disease increases with diabetes and its greater in patients with coexisting dyslipidemia. This combination of disease states is associated with significant rates of mortality and morbidity from cardiovascular events [3]. Previous studies have shown that diabetes mellitus increases risk cardiovascular disease in women, to a greater extent than in men [4]. The purpose of this study was to evaluate the effect of sex on lipid abnormalities in patients with type 2 diabetes mellitus ,and to comparing the level of lipid profiles in the premenopausal and postmenopausal patients with type 2 diabetes mellitus, with fear to good control.

Materials and methods:

This study included 112 type 2 diabetic patients and 100 age matched healthy individuals with normal glucose tolerance test (control groups).These patients and controls subject were classified as male(58 patients ,50 controls), females (54 patients ,50 controls) . Females then subdivided into premenopausal females(27 patients ,25 controls) and postmenopausal females(27 patients ,25 controls) .

BMI=weight in kilograms/ (height in meters)^2 , according to world healthy organization(WHO) criteria was calculated [5] . The fasting and postprandial blood sample, 2ml in floride bulb for sugar estimation and 5 ml in plain bulb for lipid profile estimation were collected from the capital vein. Serum was separated with in 15 minutes of sample collection by centrifuged at 3000 rpm for 10 minutes. Plasma was centrifuged at 3000 rpm for 1-2 minutes(for sugar estimation). Blood Sugar:Enzymatic, GOD-POD, endpoint colorimetric ,single reagent chemistry . (autospan kit method). Total cholesterol: Enzymatic Colorimetric Kit method, BioMerieux-France. Serum Triglycerides: Enzymatic Colorimetric Kit method, BioMerieux-France.HDL-cholesterol: CHOD-POD kit method, BioMerieux- France. LDL- Cholesterol: concentration was determined from the following equation:LDL-cholesterol =Total cholesterol - (Triglycerides / 2.825) - HDL cholesterol [6] . VLDL- cholesterol concentration was determined by dividing triglyceride value obtained on 2.825 mmol/L [7].

Statistical analysis:

The results were expressed as (mean ±SD)and analyzed statistically ,the difference between the results of patients and control group were assessed by students t test .Significant variation was considered when the P vale was less than 0.05 [8].

Results and discussion:

The mean value of total cholesterol, serum triglyceride ,LDL - cholesterol and VLDL- cholesterol in diabetic, males, females premenopausal females ,postmenopausal females ,are increases compared to control group($p<0.001$).HDL- cholesterol is decreased statistically significant ($p<0.001$) in diabetic patients compared to control groups (Table1, 2, 4,and 5).

Table 3 represent comparisons of means, standard deviation for total cholesterol, triglycerides, LDL- cholesterol, HDL- cholesterol, and VLDL- cholesterol , between the diabetic males and diabetic females. Females patients had higher level of BMI ($p<0.05$),total cholesterol($p<0.05$),triglycerides ($p<0.05$),LDL-cholesterol ($p<0.05$),VLDL- cholesterol ($p<0.05$) and low HDL- cholesterol ($p<0.05$),compared to age matched male patients.

Table 6 shows comparisons of means ,standard deviation for total cholesterol, triglycerides ,LDL- cholesterol, HDL- cholesterol ,and VLDL- cholesterol , between the diabetic premenopausal females and diabetic postmenopausal females .There was no significant difference in the total cholesterol and the triglycerides between the tow groups(P>0.05).However there was significant reduction in HDL –cholesterol and VLDL-cholesterol fraction in the postmenopausal group and significant increase in the vale of LDL-cholesterol(P<0.05).

Table1: Demographic and serum lipid profile in diabetic males and control group.

	Patients	Control group	P value
Age(Years)	49 ± 6.5	44 ± 6.2	N.S.
BMI(Kg/m^2)	25.38 ± 2.5	24.98 ± 4.2	N.S.
Triglycerides (mmol/L)	5.32 ± 2.64	2.68 ± 2.73	0.001
Total Cholesterol (mmol/L)	7.84 ± 3.13	6.11 ± 3.16	0.001
HDL- cholesterol (mmol/L)	0.76 ± 0.63	1.22 ± 0.36	0.001
LDL- cholesterol (mmol/L)	5.2 ± 2.9	3.94 ± 2.15	0.001
VLDL- cholesterol (mmol/L)	1.88 ± 0.93	0.95 ± 0.44	0.001

Table2: Demographic and serum lipid profile in diabetic females and control group.

	Patients	Control group	P value
Age(Years)	54 ± 6.7	55 ± 4.8	N.S.
BMI(Kg/m^2)	28.58 ±5.9	27.98 ±5.34	N.S.
Triglycerides (mmol/L)	7.21±4.53	4.93±2.82	0.001
Total Cholesterol (mmol/L)	9.29±4.58	6.59±2.91	0.001
HDL- cholesterol (mmol/L)	0.52±0.39	0.36±0.12	0.001
LDL- cholesterol (mmol/L)	6.22±4.01	4.485±1.78	0.001
VLDL- cholesterol (mmol/L)	2.55±1.6	1.745±.0.99	0.001

Table3:Demographic and serum lipid profile of the studied patients.

	Female	Male	P (value)
Age(yr)	54 ± 6.7	49 ± 6.5	N.S
BMI(kg/m^2)	28.58 ± 5.9	25.38 ± 2.5	P<0.05
Triglycerides (mmol/L)	7.21 ±4.53	5.32 ±2.64	P<0.05
Total Cholesterol (mmol/L)	9.29 ±4.58	7.84 ±3.13	P<0.05
HDL- cholesterol (mmol/L)	0.52 ±0.39	0.76 ±0.63	P<0.05
LDL- cholesterol (mmol/L)	6.22 ±4.01	5.2 ± 2.99	P<0.05
VLDL- cholesterol (mmol/L)	2.55 ±1.6	1.88 ±0.93	P<0.05

Table4: Demographic and serum lipid profile in diabetic premenopausal females and control group.

	Patients	Control group	P value
Age(yr)	37± 3.5	44 ± 6.2	N.S
BMI(kg/m^2)	27.1 ± 4.1	26.89 ± 5.2	N.S
Triglycerides (mmol/L)	6.15 ± 3.47	3.12 ± 0.44	0.001
Total Cholesterol (mmol/L)	8.58 ± 3.81	6.23 ± 1.46	0.001
HDL- cholesterol (mmol/L)	0.55 ±0.41	0.85 ± 0.71	0.001
LDL- cholesterol (mmol/L)	5.86 ± 3.6	3.91 ± 1.65	0.001
VLDL- cholesterol (mmol/L)	2.11 ±1.16	0.95 ± 0.38	0.001

Table5: Demographic and serum lipid profile in diabetic postmenopausal females and control group.

	Patients	Control group	P value
Age(yr)	61 ± 5.5	60 ± 5.2	N.S
BMI(kg/m^2)	26.98 ± 5.2	27.06 ± 4.66	N.S
Triglycerides (mmol/L)	7.1 ± 4.41	4.81 ± 2.12	0.001
Total Cholesterol (mmol/L)	9.52 ± 4.87	8.12 ± 3.47	0.001
HDL- cholesterol (mmol/L)	0.31 ± 0.17	0.63 ± 0.42	0.001
LDL- cholesterol (mmol/L)	6.7± 4.49	5.12 ± 2.91	0.001
VLDL- cholesterol (mmol/L)	2.51±1.52	1.7 ± 0.67	0.001

Table6: Demographic and serum lipid profile in diabetic premenopausal and diabetic postmenopausal females.

	premenopausal	postmenopausal	P (value)
Age(yr)	37± 3.5	61 ± 5.5	N.S
BMI(kg/m^2)	27.1 ± 4.1	26.98 ± 5.2	N.S
Triglycerides (mmol/L)	6.15 ± 3.47	7.1 ± 4.41	N.S
Total Cholesterol (mmol/L)	8.58 ± 3.81	9.52 ± 4.87	N.S
HDL- cholesterol (mmol/L)	0.55 ± 0.41	0.31 ± 0.17	P<0.05
LDL- cholesterol (mmol/L)	5.86 ± 3.65	6.7 ± 4.49	P<0.05
VLDL- cholesterol (mmol/L)	2.11 ± 1.16	2.51 ± 1.52	P<0.05

Analysis of lipid profile in various groups showed interesting results. All parameters of lipid profile were increase in type 2 diabetic patients compared to control groups, except HDL-cholesterol which is decreased compared to control groups. These differences were statistically very significant (p<0.001). Abnormalities in lipid metabolism secondary to insulin deficiency occur .lipolysis is stimulated and plasma FFA level rise. In the liver FFA are re-esterified into endogenous triglycerides and incorporated into VLDL- cholesterol. Cholesterol synthesis is also increased with an increase in LDL- cholesterol l [9]. Moreover, low HDL- cholesterol levels are often accompanied by triglyceride levels [10]. The result of this study showed that, diabetic female had higher plasma levels of total cholesterol, triglyceride, LDL- cholesterol. VLDL- cholesterol, and low level of HDL- cholesterol compared to age matched male patients (p<0.05). It seems that Diabetes mellitus may alter lipid profiles more adversely in female compared to male. Higher prevalence of hyperlipidemia in females was due to their higher BMI. So that, Diabetes mellitus increases the risk of cardiovascular disease in woman to great extent than in men[11-14].There are variations in lipid levels obtained in diabetic postmenopausal woman when compared to that of diabetic premenopausal woman. In determining the risk of cardiovascular disease, the absolute cholesterol value is not the most important factor; rather the concentrations of the various subclasses of cholesterol. In the present study there was no significant differences in total cholesterol level but there was

significant in reduction in the cardio protective HDL- cholesterol and VLDL-cholesterol and significant increase in atherosclerotic LDL- cholesterol . There is no doubt from this study that, the changes that occur in the lipid profiles in type 2 diabetic females after menopause is not friendly for cardiovascular health our females. After menopause, there is loss of ovarian function. This results in adverse changes in glucose and insulin metabolism, body fat distribution, coagulation, fibrinolysis and vascular endothelial dysfunction [15]. There is also derangement of lipoprotein profile independent of age [16]. A number of changes that occur in the lipid profile after menopause are associated with increased cardiovascular disease risk. Lack of estrogen is an essential factor in this mechanism. A part from maintaining friendly lipid profile, estrogen changes the vascular tone by increasing nitrous oxide production. It stabilizes the endothelial cells, enhances antioxidant effects and alters fibrinolytic protein [17]. All these are cardio protective mechanisms, which are lost in menopause. In fact it has been postulated that, most of diabetic patients have hyperlipidemia. Hyperlipidemia is more aggressive in postmenopausal diabetic females. It is thus important to note this and device means of correcting the hyslipidemia since the use of HRT and lipid lowering drug is still controversial. It is important to counsel on proper dietary, social and physical habits.

References:

1-Joe, A. F.; and Bryan, F. Y. (1999)-Treatment of type 2Diabetes mellitus. Journals, Amirican family physician. 59 (10):4849-4871.

2-Frederickson, D.; and Lee, R. (1965) - Asystem for phenotyping hyperlipidemia, Circulation.31:321-327.

3-Abbot, R. D.; Wilson, P. W.; Kannel,W. B.; and et. al. (1988)- High-density lipoprotein cholesterol, total cholesterol screening and myocardial infarction. The Framingham study. Arterosclerosis 8:207.

4-Juutilainen, A.; Kortelainen, S.; Lehto, S.; and et.al. (2004)- Gender difference in the impact of type 2 diabetes on coronary heart disease risk. Diabetes Care. 27(12):2898-2904.

5-World Health Organization :Obesity: (1997)- preventing and managing the global epidemic: report of a World Health Organization Consultation. Geneva, Switzerland: June:3–5.

6-Friedwald, W.T.;Levy, R.L.; Fredrickson, D. S. (1972)-Estimation of the concentration of low density lipoprotein cholesterol in plasma without use of the preparative ultracentrifuge *Clin., Chem*. 18: 499.

7-Henry, J. B. (1991)- Clinical Chemistry. In Clinical and Diagnosis Management by Laboratory Methods. 18th Edition, *W.B.* Saunders Company London 189-214.

8-Zar ,J. H. (1999) -Biostatistical analysis . 4th edition ,Prentic Hall , Inc. ,Newjersey ,pp.286.

9-Lamarche, B.; Despres, J.P.; Moorjani, S.; and et. al.(1996)-Triglycerides and HDL-cholesterol as risk factors for ischemic heart disease. Results from the Quebec cardiovascular study. Atherosclerosis. 26; 119(2):235-245.

10-Kannel, W.B.; Mcgee,D.L. (1979) - Diabetes and cardiovascular disease. The Framingham study. JAMA. 11; 241(19):2035-2038.

11-Lee, W.L.; Cheung, A.M. ; Cape, D. ; and et. al. (2000) - Impact of diabetes on coronary artery disease in women and men: a meta-analysis of prospective studies. Diabetes Care. ;23(7):962-968.

12-Kanaya, A.M.; Grady,D.; Barrett-Connor,E.(2002)- Explaining the sex difference in coronary heart disease mortality among patients with type 2 diabetes mellitus: a meta analysis. Arch Intern Med.; 162(15):1737-1745.

13-Barrett- Connor, E.; Wingard, D.L. (1983)- Sex differential in ischemic heart disease mortality in diabetics: a prospective population-based study. Am J Epidemiol. :118(4):489-496.

14-Barrett-Connor, E.; Giardina, E. G.; Gitt, A. K.; and et.al. (2004) - Women and heart diseasethe role of diabetes and hyperglycemia. Arch Intern Med.; 164(9):934-942.

15-Spencer, C. ; Godsland, H. ; Stevenson, J. C. (1977)- Is there a menopausal metabolic syndrome? Gynecol. Endocrinol. 11: 341-335.

16-Bales, A. (2000)- In search of lipid balance in older women; New studies raise questions about what works best. *Postgrad. Med.* 108 (7) : 57-72.

17-Taddec, S. ; Virdis, A.; Ghiadoni L. ; and et.al. (1996)- Menopause is associated with endothelial dysfunction in women. Hypertension 28:576-582.

مستويات الدهون المصلية لدى المصابين بالسكري من النوع الثاني من النساء والرجال .الاكثر عرضة للأصابة بتصلب الشراين هم النساء في فترة ما بعد أنقطاع الطمث .

رشا شاكر نعمه مها عبد الكاظم باسم محمد علي

قسم الكيمياء ، كلية العلوم ،جامعة الكوفه

الخلاصة :

في الدراسة الحالية تم تقيم التغيرات الحاصلة في مستويات الدهون المصلية لدى المصابين بالسكري من النوع الثاني من النساء والرجال بالمقارنة مع مجاميع سيطرة مناسبة . بالأضافة الى ذلك تمت مقارنة مستويات الدهون المصلية بين المرضى من النساء والرجال وكذلك بين النساء المصابات بالسكري بأعمار ما قبل أنقطاع الطمث مع مثيلاتهن من المريضات بأعمار ما بعد أنقطاع الطمث .أن معدل كتلة الجسم BMI وكذلك الفحوصات السريرية المتضمنة مستويات الدهون والدهون البروتينية المصلية تم تقديها لمجاميع المرضى والاصحاء . أظهرت النتائج أرتفاع معنوي (P<0.001)في الكوليستيرول وثلاثي الكلسريد و LDL كوليستيرول وVLDL كوليستيرول ونقصان معنوي في مستويات HDL كوليستيرول لدى المرضى جميعهم عند مقارنتهم بالمجاميع الضابطة، من ناحية أخرى أظهرت مستويات BMI والكوليستيرول وثلاثي الكلسريد و LDL- كوليستيرول و VLDL -كوليستيرول ونقصان معنوي في مستويات HDL كوليستيرول لدى الاناث المصابات بالسكري عند مقارنتهن مع الرجال المصابين بالسكري .فضلا عن ذلك،فلم تظهر المقارنة بين مستويات الكوليستيرول وثلاثي الكلسريد أي فرق معنوي بين النساء المصابات بداء السكري في أعمار ما قبل الطمث ومثيلاتهن باعمار ما بعد الطمث (P>0.05) .بينما أظهرLDL-كوليستيرول VLDL-كوليستيرول أرتفاع معنوي (P<0.05) وأنخفاض معنوي في HDL-كوليستيرول(P<0.05) .تشير النتائج الى أن لعامل الجنس تأثير في أرتفاع نسبة الدهون المصلية. بالأضافة الى ذلك أن النساء المصابات بداء السكري وبأعمار ما بعد أنقطاع الطمث أكثر عرضة لأرتفاع نسبة الدهون المصلية من المريضات بداء السكري وبأعمار ما قبل أنقطاع الطمث. وبالتالي فهن أكثر عرضة لتطور أمراض القلب والاوعية.