

STUDY OF LIPID PROFILE IN DIABETIC PATIENTS

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Abstract

This present (cross-sectional) study was carried out from December, 2015 to March, 2016 in AL-Sader teaching hospital, Misan city to detect the correlation between the diabetes mellitus and hyperlipidemia among 110 diabetic patients (60 females and 50 males) as a selected sample ranged from (21-80) years. The lipid profile and glucose level were measured using the Architect c4000 clinical chemistry analyzer (Abbott Diagnostics, Abbott Park, IL, USA).

The results showed that the majority of patients fell in the age range of (51-60) years with 37 (33.6 %) cases. Also the majority of patients were having type 2 diabetes with 96 (87.3 %). It was demonstrated that there were significant correlations between the (T.G, LDL, HDL, and V.L.D.L) with both duration of DM and F.B.S ($p_{\text{value}} < 0.05$). There is no difference in mean of Cholesterol and H.D.L scores according to the gender but there were significant correlation between (T.G, LDL, and VLDL) and gender. The study finds that there were high mean score in (T.G) for age groups include (31-40) years, (41-50) years, (51-60) years, (61-70) years. Also for (L.D.L) there high mean score in age groups include (21-30), (41-50), (51-60), (61-70) years. For H.D.L there were abnormal (low level) of mean score fore age groups include (21-30), (51-60), (61-70), (71-80) years.

It was concluded that there is significant correlation between lipid profile except cholesterol and glucose level in the diabetic patients. And the hyperlipidemia is could be consider as commonest complication of diabetes mellitus and it predisposes them to premature atherosclerosis and macrovascular complications.

الخلاصة

ان هذه الدراسة (المقطعية) قد انجزت ابتداء من شهر كانون الاول 2015 ولغاية شهر مارس (آذار) 2016 في مستشفى الصدر التعليمي في محافظة ميسان لتحديد العلاقة بين مرض السكري وارتفاع مستوى الدهون في الدم لدى 110 مريض بداء السكري (60 منهم اناث و40 منهم رجال) كعينة مختارة تتراوح اعمارهم ما بين (21-8-) سنة. ان تحديد صورة الدهون ونسبة السكر في الدم قد تمت باستخدام جهاز (Architect c4000 clinical chemistry analyzer) من شركة (Abbott Diagnostics, Abbott) (Park, IL, USA).

اظهرت النتائج ان الغالبية العظمى من الحالات كانت ضمن الفئة العمرية (15-60) سنة وبنسبة 33.6% ، كما ان اكثر المرضى كانوا يعانون من مرض السكري النوع الثاني وبنسبة 87.3%. وكذلك اوضحت النتائج ان هناك علاقة بين الدهون الثلاثية (TG) ، البروتين الدهني قليل الكثافة (LDL) ، البروتين الدهني عالي الكثافة (HDL) ، البروتين الدهني قليل الكثافة جدا (VLDL) وبين كلا من مدة الاصابة بالسكري وتحليل سكر الدم بعد الامساك ، حيث كانت (p-value) اقل من ($0.05 <$).

لم توجد الدراسة علاقة معنوية بين معدل مستوى الكوليسترول (HDL) وبين جنس الحالات ، ولكن هناك علاقة بين (TG) ، (LDL) ، (VLDL) والجنس. كما ان الدراسة اظهرت ان هناك ارتفاع لمعدل مستويات ال(T.G) في كل من الفئات العمرية (31-40) سنة ، (41-50) سنة ، (51-60) سنة ، (61-70) سنة ، وكذلك ارتفاع معدل (L.D.L) في الفئات/ سنة (21-30) ، (41-50) ، (51-60) ، (61-70) ، بنما هنالك انخفاض غير طبيعي لل(HDL) في الفئات العمرية (21-30) ، (41-50) ، (51-60) ، (61-70) ، (71-80) سنة.

من خلال نتائج الدراسة الحالية ، فانه من الممكن الاستنتاج ان هناك علاقة بين صورة الدهون ونسبة الكلويز (السكر) في الدم بالنسبة لمرضى السكري ، وكذلك فان ارتفاع الدهون الضارة بالدم من الممكن ان يعتبر اكثر المضاعفات شيوعا بالنسبة لمرضى السكري ، والاخير يعتبر كعامل مساعد على بداية تصلب الشرايين والمضاعفات الوعائية القلبية.

Introduction

Diabetes is the third leading cause of death by disease, primarily because of the high rate of cardiovascular disease (myocardial infarction, stroke, and peripheral vascular disease) among people with diabetes (1).

Diabetes mellitus is a group of metabolic diseases characterized by elevated levels of glucose in the blood (hyperglycemia) resulting from defects in insulin secretion, insulin action, or both (2). The insulin and the glucagon together maintain a constant level of glucose in the blood by stimulating the release of glucose from the liver. Initially, the liver produces glucose through the breakdown of glycogen (glycogenolysis). After 8 to 12 hours without food, the liver forms glucose from the breakdown of noncarbohydrate substances, including amino acids (gluconeogenesis) (3). Hyperlipidemia is a condition excess of fatty substances called lipids, largely cholesterol and triglycerides, in the blood. It is also called hyperlipoproteinemia because these fatty substances travel in the blood attached to proteins. This is the only way that these fatty substances can remain dissolved while in circulation (4).

In insulin resistance and type 2 diabetes, increased efflux of free fatty acids from adipose tissue and impaired insulin-mediated skeletal muscle uptake of free fatty acids increase fatty acid flux to the liver (5). The fact that free fatty acid levels are elevated in individuals with impaired glucose tolerance suggests that insulin resistance associated with elevated free fatty acid levels occurs before the onset of hyperglycemia (6). One study conducted in patients without diabetes showed that decreased glucose utilization in muscle was associated with acute elevation of free fatty acids (7).

Epidemiologic studies have also demonstrated a relationship between plasma free fatty acid levels and insulin resistance (8). In the presence of insulin resistance, free fatty acids in the form of triglycerides are deposited in muscle, liver, heart, and pancreas, notably, agents that lower elevated free fatty acids, such

as the thiazolidinediones (TZDs), have been shown to improve insulin sensitivity in muscle, liver, and adipose tissues(9). Insulin resistance also increases hepatic lipase activity, which as noted above, is responsible for hydrolysis of phospholipids in LDL and HDL particles and leads to smaller and denser LDL particles and a decrease in HDL (10).

Insulin resistance are associated with a clustering of interrelated plasma lipid and lipoprotein abnormalities, which include reduced HDL cholesterol, a predominance of small dense LDL particles, and elevated triglyceride levels. Increased hepatic secretion of large triglyceride-rich VLDL and impaired clearance of VLDL appears to be of central importance in the pathophysiology of this dyslipidemia (11) Small dense LDL particles arise from the intravascular processing of specific larger VLDL precursors, Typically, reduced plasma HDL levels in type 2 diabetes for most patients (12).

These data suggest that the characteristic dyslipidemia associated with insulin resistance and type 2diabetes is highly correlated with increased cardiovascular risk (13).

Aims of the study:

- 1- Determine the correlation between the diabetes mellitus and hyperlipidemia.
- 2- To focus attention on the effect of diabetes duration on developing lipid disorder.
- 3- Recognize the effect of diabetes type by hyperlipidemia.
- 4- To determine if the sex has an influence on the hyperlipidemia in diabetic patient.
- 5- To Detect the risky age group for developing hyperlipidemia in diabetic patient

Materials and Methods

Design of the study (methods):-

We applied the procedure as the principle of cross-sectional study to the patients with diabetes to document the results of their laboratory tests when it is already has been ordered by the doctor. The samples and data point were collected at AL-Sader teaching hospital , Missan ,Amara , Data was collected within a (4) months' time period December ,2015 to March ,2016.

Data was collected from patients came through outdoor patient department (OPD) Data was entered in retrospective paper chart review of all patients with diagnoses of either type 1 or type 2 diabetic patients.

The data saved and analyzed in Microsoft Excel version (2010) and statistical package of social science (SPSS) (20.00) by using Pearson Correlation and Levene's Test.

Materials:

Every patient was advise for at least 5ml venous blood sample were collected by applying alcohol and rubbery tape and the blood placed in a disposable syringe on morning for the serum lipid profile and fasting blood sugar (Subjects at risk for diabetes who were admitted to the hospital were selected to participate in this study. All participants signed their written informed consent to provide blood samples for research purposes. Blood serum concentrations of diagnostic substances (glucose, total cholesterol, triglycerides, low-density lipoprotein (LDL), and high-density lipoprotein (HDL) were measured using the Architect c4000 clinical chemistry analyzer (Abbott Diagnostics, Abbott Park, IL, USA).). VLDL was estimated by the following equation: $VLDL \text{ mg/dl} = \text{Triglycerides (mg/dl)} / 5$. LDL can be estimated also as following: $LDL = \text{CHOL} - (\text{HDL} + \text{VLDL})$.

The results

The results presented in this section are based on the analytic data of the total 110 cases (60 females and 50 males) consecutive cases who suffered from diabetes mellitus for the diagnosis of hyperlipidemia.

Patients with type 1 diabetes were 14 (12.7%) case, while patients with type 2 diabetes were 96 (87.3 %) case within a ranged age from (21) to(86) years and ranged duration of diabetes from (1 year) to (25 years).

1. Distribution of studied groups according to demographic data

Result in table (1) showed the majority of patients fell in the age range of (51-60) years with 37 (33.6 %) cases. The table also shows that the majority of participants were female (54.5 %). Also the majority of patients were having type 2 diabetes with 96 (87.3 %). In regarding of duration of diabetes mellitus, the majority of patient was in range (1-5) years with 56 (50.9%).

Table (1): Distribution of the Patients by their demographic characteristics

No.	Variables	characteristics	F	%
1-	Age (year)	21-30	3	2.7
		31-40	14	12.7
		41-50	36	32.7
		51-60	37	33.6
		61-70	16	14.5
		71-80	4	3.6
		Total	110	100.0
2-	Gender	Male	50	45.5
		Female	60	54.5
		Total	110	100.0
3-	Type of Diabetes Mellitus	Type 1 diabetes	14	12.7
		Type 2 diabetes	96	87.3

		Total	110	100.0
4-	Duration of Diabetes Mellitus	1-5	56	50.9
		6-10	28	25.5
		11-15	14	12.7
		16-20	9	8.2
		21-25	3	2.7
		Total	110	100.0

No. = number of Variable , F=frequencies , % = Percentages

2. Determine the correlation between the diabetes mellitus and hyperlipidemia

Table (2) showed that there were no statistically significant correlation between the lipid profile and D.M type.

The finding of this table also reveals that there were significant correlations between the (T.G, LDL, HDL, and V.L.D.L) with both duration of DM and F.B.S ($p_{\text{value}} < 0.05$).

Table (2): Determine the correlation between the diabetes mellitus and hyperlipidemia

Hyperlipidemia Diabetes Mellitus		Lipid profile				
		Cholesterol	T.G	L.D.L	H.D.L	V.L.D.L
Type of D.M.	Pearson Correlation	-0.028	0.128	-0.110	0.096	0.128
	Sig.	0.774	0.184	0.253	0.317	0.184
F.B.S. Test	Pearson Correlation	0.099	-0.196*	0.266*	-0.312**	-0.196*
	Sig.	0.305	0.040	0.005	0.001	0.040
Duration of D.M.	Pearson Correlation	0.084	-0.189*	0.271*	-0.416**	-0.189*
	Sig.	0.382	0.048	0.004	0.000	0.048

No. = number of item , F=frequencies , % = Percentages, M.S.= mean of score. Ass.= assessment, Cut-off-point interval : 1-1.67 = Low; 1.68-2.33 = Moderate; 2.34-3.00 = High

3. Distribution of gender in patient with cause correlation and lipid profile.

Table (3) reveals that there is no difference in mean of Cholesterol and H.D.L scores according to the gender but there were significant correlation between (T.G, LDL, and VLDL) and gender.

Table (3). Distribution of gender in patient with cause correlation and lipid profile and comparison significant.

Hyperlipidemia	Gender	No.	Mean	Levene's Test	
				F	Sig.
Cholesterol	Male	50	188.39	3.532	0.063
	Female	60	185.82		
T.G	Male	50	201.07	8.801	0.004
	Female	60	200.23		
L.D.L	Male	50	108.76	4.968	0.028
	Female	60	106.59		
H.D.L	Male	50	39.41	0.985	0.323
	Female	60	39.18		
V.L.D.L	Male	50	40.21	8.801	0.004
	Female	60	40.05		

4. Detect the risky age for developing hyperlipidemia in diabetic patient:

Table 4 showed correlation between lipid profile and age of diabetic patient, the result reveals that there were high mean score in (T.G) for age groups include (31-40) years,(41-50) years,(51-60) years, (61-70) years. Also for (L.D.L) there high mean score in age groups include (21-30), (41-50), (51-60), (61-70) years. For H.D.L there were abnormal (low level) of mean score fore age groups include (21-30), (51-60),(61-70),(71-80) years.

Table (4) Distribution of lipid profile according to the age groups of diabetic patient.

Lipid profile	Age	N	Mean	Std. Deviation
Cholesterol	21-30	3	189.00	68.088
	31-40	14	182.24	47.280
	41-50	36	190.11	39.875
	51-60	37	196.68	54.465
	61-70	16	173.38	53.424
	71-80	4	138.75	51.797
T.G	21-30	3	108.10	29.047
	31-40	14	217.93	150.227
	41-50	36	214.22	98.201
	51-60	37	216.14	103.144
	61-70	16	157.13	75.071
	71-80	4	117.25	48.452
L.D.L	21-30	3	136.55	78.082
	31-40	14	96.05	40.079
	41-50	36	104.93	36.974
	51-60	37	115.96	53.799
	61-70	16	106.79	43.999
	71-80	4	75.55	47.352
H.D.L	21-30	3	30.83	10.149
	31-40	14	42.61	13.600
	41-50	36	42.34	9.837
	51-60	37	37.49	8.433
	61-70	16	35.16	12.047
	71-80	4	39.75	6.397

V.L.D.L	21-30	3	21.62	5.809
	31-40	14	43.59	30.045
	41-50	36	42.84	19.640
	51-60	37	43.23	20.629
	61-70	16	31.43	15.014
	71-80	4	23.45	9.690

Discussion

Lipid abnormalities are common in diabetics and frequently seen in type-2 diabetics. Dyslipidemias make diabetics prone to develop CHD and other complications of atherosclerosis (14). According to the CDC, 97% of adults with diabetes have one or more lipid abnormalities while the prevalence of diabetic dyslipidemia varies from 25% to 60% in other studies (13). This variation in prevalence may be due to differences in BMI and possibly genetic variation. A study conducted in Nishtar Hospital, Multan by Ahmad et al showed that 21% patients with diabetes had raised serum cholesterol (>200mg/dl) and 34.2% patients have raised triglycerides in serum (>150mg/dl) (15). Another study conducted at Hazara division Pakistan on “Frequency of dyslipidemia in type2 diabetes mellitus in patients of hazara division” showed that serum triglyceride was raised in 59% (16). Whereas, in our study serum cholesterol level >200mg/dl was found in 30% patients with diabetes and serum TG was raised in 61% diabetics this meant that the most Common recognized abnormality was hypertriglyceridemia which is agreed with study by Dixit et al (17). The reason for difference in serum cholesterol and T.G values may be due to difference in the dietary habits.

In regarded to the relation between F.B.S and lipid profile of our correlation studies demonstrated significant positive correlation of blood sugar With T.G,

L.D.L, H.D.L, and V.L.D.L, but only cholesterol did not show significant correlation .this result is partly showed compatible with study by Dixit et al(**17**).

In relation to duration of diabetes in our study there were significant correlations between it and lipid profiles except total cholesterol, the distribution of all the types of lipid abnormalities increased with an increase in the duration of diabetes in our study except TC, which is compatible with another study (**18**).

In a study by Shabana S. *et al* showed that a linear increase in mean serum total cholesterol, triglycerides and LDL cholesterol and a decrease in HDL cholesterol with increase in duration of diabetes was noted in both the genders (**19**), in contrast to another study by Otamere et al (**20**) which did not show any association of lipid levels with duration of diabetes.

In our study, serum TG , L.D.L, V.L.D.L levels were found to be much raised among diabetic females as compared to males Our results are partly consistent with a study by Firdous *et al*, who reported that adverse effects of diabetes mellitus on dyslipidemias are more marked in women than men(**21**). This explains why, diabetes eliminates or attenuates a woman's protection against IHD. This finding was disagreed with that by Ahmad *et al*. (**22**) .

Also our study showed that H.D.L level <40 more in female than in male 58.3% vs 48% this result competent with that by (**19**) .

In our study the prevalence of dyslipidemia by age appeared to be higher in the subgroups between 41-51, 51-60 and 61-70 which is partly agreed with study by (**19**) and other study (**23**) which sowed that In both male and female subjects, there was a trend to higher levels of all lipids except HDL-C with increasing age, which reached a plateau after the age of 50yrs in male and 55yrs in female diabetics. The distribution of the all types of lipid abnormalities by age showed no particular pattern of predominance. This data was in agreement with other studies although the cut off levels differed slightly (**24**).

Conclusions

The study has come up with the following conclusions:

1. In conclusion, hyperlipidemia is the commonest complication of diabetes mellitus and it predisposes them to premature atherosclerosis and macrovascular complications.
2. The most Common recognized lipid abnormality was hypertriglyceridemia.
3. There is significant correlation between T.G, L.D.L, H.D.L, and V.L.D.L and F.B.S in the diabetic patients.
4. There is significant association between lipid profile except cholesterol with duration of diabetes and it rise with increase the duration of D.M.
5. There is significant correlation between T.G, L.D.L, and V.L.D.L with the gender of patient were the prevalence of dyslipidemia was higher in female than male.
6. The prevalence of dyslipidemia occurs more commonly in age range from 41-70 years.
7. The cholesterol did not showed significant association with F.B.S.

The study is recommended that:

- 1- To minimize the risk of developing coronary artery disease and atherosclerosis we should try to perform good glycemic control where that can prevent development and progression of lipid abnormalities among patients with diabetes mellitus.
- 2- Because hyperlipidemia usually has no noticeable symptoms we recommended performing periodically examination of lipid profile for diabetic patient for early diagnosis and management its development.

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