International Journal of Multidisciplinary and Current Research

Research Article

ISSN: 2321-3124
Available at: http://ijmcr.com

Lipid Profile Alteration and Atherogenic Indices in Patients with DMII

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Accepted 30 Sept 2015, Available online 05 Oct 2015, **Vol.3** (**Sept/Oct 2015 issue)**

Abstract

Dyslipidemia is one of the major risk factors for cardiovascular disease in diabetes mellitus. Diabetic's patients have a type of dyslipidemia that is related to insulin resistance. This profile is consisting with decreased high-density lipoprotein (HDL), increased triglycerides, slightly increased low-density lipoprotein (LDL), and LDL particles that are smaller and denser. Aim of the paper work was to verify and document, role and correlation of lipid disorders (dyslipidemia) and hyperglycemia in the pace of progress and the appearance of cardiovascular diseases in patients with Diabetes Mellitus type2. The present work included; one hundred forty eight patients with diabetes mellitus type2, were enrolled in this retrospective, cross-sectional study, who included (72 male and 76 female) aged (25-64 years).Total cholesterol were more than 200mg/dl in more than 50% of studied patients, while HDL less than 40mg/dl in 68.3% patients, whereas LDL level greater than 100mg/dl in 63.5% of patients. Triglyceride level was higher than 140mg/dl in 51.4% of all patients. Diabetic female had higher plasma cholesterol and lower plasma HDL in comparison with male, whereas LDL and triglyceride were significantly increase compared with male. AIP of both male and female were higher than normal value. CRC and AC of both genders were greater than normal value, although atherogenic indices of female were higher than that for male.

Keywords: *DMII, atherogenic indices, lipid profile*

1. Introduction

A characteristic pattern, termed diabetic dyslipidemia, consists of specifically mild to marked elevation of triglyceride-rich lipoproteins (VLDLs) and VLDL remnants concentrations and low levels of HDL-C. Raised serum triglycerides and low HDL-C often precede the onset of T2DM for many years. In addition, LDL particles are converted to smaller, perhaps more atherogenic, lipoproteins termed 'small-dense LDLs [(1,2)].

Different mechanisms are responsible for the development of dyslipidemia in individuals with diabetes. Defects in insulin action and hyperglycemia could lead to dyslipidemia in patients with diabetes. In the case of T2DM, the obesity/insulin-resistant state that is at the basis of the development of this disease can in itself lead to lipid abnormalities independently of hyperglycemia. In poorly controlled T1DM hypertriglyceridemia and reduced HDL-C commonly occur, but in most cases insulin replacement in these patients correct these abnormalities. In T2DM, this phenotype is not usually fully corrected with glycemic control, suggesting that insulin resistance and not hyperglycemia *per se* are associated with this lipid abnormality.[(3)]

Materials and Methods

Patients Data

One hundred forty eight patients with diabetes mellitus type2 (DMII), were enrolled in this retrospective, cross-sectional study, who included (72 male and 76 female) aged (25-64 years), were consecutively presented to the Diabetic center of Al-Yarmuok hospital ,affiliated to Al-mustansiryiah college of medicine, from Nov.2010 to Feb.2011. The diagnosis of DM was based on the American Diabetes Association criteria for type 2 DM (fasting plasma glucose level higher than 126mg⁄dl and ⁄or glucose level exceeding 200mg⁄dl at 2 hours in the 75 g oral glucose tolerance test). For each patient a questionnaire including epidemiological data such as age, gender, duration of DM, and hypertension.

Laboratory Data

Blood samples were collected in fasting state and were analyzed for total cholesterol (TC), serum triglycerides (TG) and high density lipoprotein (HDL) using specific enzymatic methods. The low density lipoprotein (LDL) was derived by Fredrickson- Friedwald formula [LDL= (TC-HDL)-TG/5]. The atherogenic indices were also calculated.

Methods

Cholesterol was determined after enzymatic hydrolysis and oxidation.

Using cholesterol kit manufactured by joaquim costa company/spain.

Triglyceride in sample originates by means of the coupled reaction, a colored complex that can be measured by spectrophotometer (Aple), whereas HDL was determined using specific kit. Both triglyceride and HDL kits were manufactured by joauim Costa Company.

LDL concentration was calculated using the following formula:

LDL= CHOLESTROL-(T.G+HDL)/5

Atherogenic indices were calculated using special formula
Atherogenic index of plasma (AIP) =log (T.G/HDL)
Cardiac risk ratio (CRR) =Cholesterol/HDL
Atherogenic coefficient (AC) =Cholesterol-HDL

Results and discussion

A total of 148 patients with type 2 DM, (72 male and 76 female) were studied to assessed the alteration in lipid profile and atherogenic indices.

Date illustrated in table and figure (1) showed that there was highly significant difference (P > 0.01) in prevalence of diabetes mellitus type II among different age groups. Since, Kenneth and William [(4)] confirmed that type II DM may affect individuals older than 40 years, although is being recognized increase in younger person, particularly in highly susceptible racial and ethnic group and the obese.

Table (1): Distribution of patients according to age range

Age Range (years)	No. of Patients	P – Value
25-34	8	P = 0.001 * H.S
35-44	34	
45-54	55	
55-64	51	
Total	148	

* H.S: Highly Significant

Table (2): Mean percentage of lipid fractions in diabetic patients

Lipid type		All patients	Female	Male	P- Value
Cholesterol	Normal	49.3%	40.7%	58.4%	P = 0.032
	High	50.7%	59.3%	41.6%	* S
HDL	Normal	31.7%	11.8%	52.7%	P = 0.000
	High	68.3%	88.2%	47.3%	H.S
LDL	Normal	36.4%	28.9%	44.4%	P = 0.074
	High	63.6%	71.1%	55.6%	N.S
T.G	Normal	48.6%	47.4%	55.6%	P = 0.248
	High	51.4%	52.6%	44.4%	N.S

Table (3): Mean conc. of lipid profile fraction

Gender	Mean conc. of cholesterol (mg/dl)	Mean conc. of HDL(mg/dl)	Mean conc. of LDL(mg/dl)	Mean conc. of T.G (mg/dl)
Male	189.2	48.2	112.8	161
Female	210.1	38.4	136.8	183.29

The Prevalence of different types of dyslipidemia in all of the patients including both gender are shown in table (2).

Total cholesterol were more than 200 mg/dl in 75 (50.6%) and HDL were less than 40 mg/dl in 101 (68.3%) of all patients. LDL level higher than l00 mg/dl were present in 94 (63.5%), while 76 (51.4%) of patients have had triglyceride level higher than 140 mg/dl.

The results in table (3) revealed that diabetic females had higher plasma level of total cholesterol (210.1 mg/dl vs. 189.2 mg/dl) (P < 0.05) and lower plasma level of HDL (38.4 mg/dl vs. 48.2 mg/dl) (P < 0.01) compared to matched male patients, whereas LDL and triglyceride were significantly increased in females (136.8 mg/dl; 71.1% ; 183.29 mg/dl, 52.6%) in comparison to males (112.8 mg/dl; 55.6% ; 161mg/dl; 44.4%) respectively (P < 0.05). A strong clustering risk factor for coronary artery disease has been observed in diabetic subjects.

The alteration in lipid profile of diabetic patients in present work are in agreement with finding of ononogbu[(5)], uddin and miah[(6)], sccopla *et al*. [(7)] Adedeji and onitril[(8)].

Recent studies have demonstrated that in diabetic patients TG level is a risk factor for CVD independent of HDL level and despite glycemic control [(9, 10)], mean level of total cholesterol and LDL in those with type 2 diabetes may not differ significantly from those in non-diabetic subjects. Type 2 diabetic patient have an abnormally high number of small, dens LDL particles [(11, 12)].

Type 2 DM is also associated with low plasma level of HDL [(13)]. It is well documented that reduces HDL level are

associated with an increased risk of coronary heart disease [14]. It may be due to a number of HDL particles functions that possibly will contribute to direct cardio protective effects, including promotion of cellular cholesterol efflux and anti-oxidative and anti-inflammatory properties [15].

It has been reported that type 2 DM increased the risk of CHD more markedly in women than in men [16]. A diverse changes induced by type 2 DM in some cardiovascular risk factors such as HDL, total cholesterol, TG , LDL particle size and blood pressure have been found to be more pronounced in women than in men [17,18]. Juutilainen and his team in their study of 1059 types diabetic subjects aged 45-64 years found a considerably higher diabetes related relative risk for a major CHD event in diabetic women than in men [19].

Significant difference in lipid profile of male and female patients is because sex hormones play unique role for lipid metabolism [20].

The present data illustrated table (4) shows that there were a highly significant difference in mean percent of AIP for both male and female (0.59; 0.646) respectively in comparison with normal value (0.214) at P= 0.000.

Table (4) Comparison between Atherogenic Indexes of Plasma of Both Genders

Gender	No. of Patients	Mean of AIP	SD	P – Value
*Male	72	0.59	0.2133	*P = O.237 N.S
*Female	76	0.646	0.1993	
Normal value	0.214			**HS p=0.000

The results in table (4) revealed that AIP of female was greater than that for male, although statistically no signification difference. AIP refers to the atherogenic index of plasma and is calculated in an attempt to predict cardiovascular risk. AIP is based on the ratio of the values of triglycerides to high-density lipoprotein (HDL) levels. When placed into the scope of AIP, triglycerides and HDL refers to the relationship of atherogenic lipids to protective lipids. The AIP has demonstrated cardiovascular risk in clinical trials [21, 22].

The mean percent of AIP were increased with progression in duration of disease, as cleared in table (5), despite of no significant difference (P>0.05) in mean percent of AIP according to duration of disease.

Table (5): Comparison among AIP in diabetic patients according to duration of disease

Duration of disease (years)	No. of Patients	Mean of AIP	SD	P – Value
1-4	90	0.587	0.2107	(ANOVA) P = 0.484 N.S
5-8	32	0.614	0.2234	
9-12	16	0.62	0.1762	
13-16	10	0.635	0.2086	

Talat and colleague found that duration of diabetes was associated with higher incidence of dyslipidemia.[23] In that study they found elevated total cholesterol, low density lipoprotein and triglycerides but normal HDL. These results in parallel with the present data.

The results table(6) showed that there were a highly significant difference in percent of AIP of both gender comparing with normal value, while no significant difference in mean percent of cardiac risk ratio (CRR) and atherogenic coefficient (AC) of both genders in comparison with normal value.

Despite exceeding the mean percent of (CRR) and (AC) above the normal value, although these results statistically non-significant.

Table (6): Atherogenic Indices for Both Genders

Atherogenic indices	Male	Female	Normal value	P – Value
Cardiac risk Ratio (CRR)	*4.59	*5.1	**4.494	*P > O.05 N.S
Atherogenic coefficient (AC)	*3.58	*4.1	**3.494	**P > 0.05 N.S
Atherogenic index of plasma (AIP)	*0.59	*0.646	***0.214	***P = 0.000 H.S

Indeed, atherogenic indices are powerful indicators for the risk of heart disease, the higher the values the higher the risk developing cardiovascular disease and vice versa

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