Metabolic control and serum lipid changes in diabetic Iraqi men

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Abstract

The objective of this study is to demonstrate the changes in serum lipid of diabetic Iraqi men. Comparative change in serum lipid of 36- patient's type-1 and 48-patients type-2 diabetic men, with two groups of healthy non-diabetic men. HbA1c is used both as a marker for long term glycemic control and the effect of metabolic control. The serum lipids are elevated in both types of diabetes with serum triglyceride more affected than other lipid types. The high density lipoprotein cholesterol was lower in type 2 diabetes than control. Together, these data demonstrated that the serum level of triglyceride is more affected than other lipid types in patients with DM.

Keywords: Diabetes; Dyslipidemia; Glycated hemoglobin

Introduction

DM is a global endemic with rapidly increasing prevalence in both developing and developed countries [1]. DM is the most common endocrine disease, and is associated with vascular changes resulting in accelerated atherosclerosis [2]. This association exists in patients with type 2DM in whom plasma insulin levels may be low, normal or even high and is accompanied by changes in plasma lipids and lipoproteins regardless the mode of treatment [3]. DM is a chronic metabolic disorder characterized by impaired metabolism of glucose, protein and fat, as well as the late development of vascular (involving small and large blood vessels)

and neuropathic complications [4, 5]. DM consists of a group of disorders involving distinct pathogenic mechanisms in which hyperglycemia is the common denominator [5]. DM is frequently associated with dyslipidemia and increased percentages of glycated hemoglobin. Patient with type 1 DM are generally not hyperlipidemic if they are under good glycemic control. But patient with type-2 DM are usually dyslipidemic even if under relative good glycemic control. They have several lipid abnormalities including elevated plasma triglycerides, elevated Low Density Lipoprotein Cholesterol (LDL-C) and decreased High Density Lipoprotein-Cholesterol (HDL-C). Dyslipidemia is a risk factor for coronary artery disease, a

leading cause of mortality in patients with diabetes mellitus. Dyslipidemia remains largely undiagnosed and under treated in high risk populations, such as patient with type-1 diabetes [6]. Type 2 DM and the metabolic syndrome are both becoming more prevalent, and both increase the risk of cardio vascular disease. Many patients are prone to atherogenic dyslipidemia, the so-called "atherogenic lipid triad" involving high serum TG levels, low serum HDL-C levels, and a preponderance of small, dense, LDL-C particles. All of the processes involved in atherogenesis can be exacerbated by insulin resistance and/or the metabolic syndrome [7]. It has been claimed, in general, that improvement in the glycemic control would result in a better plasma lipid profile [8, 9]. The present study has been undertaken to demonstrate changes in serum lipid in type 1 and type 2 diabetic Iraqi men. Glycated hemoglobin has been estimated as an index for glycemic control.

Methods

36 type 1 and 48 type 2 diabetic Iraqi men were studied. They were selected from the out-patient diabetic clinic of Diwanyia Teaching Hospital which the main government is owned hospital that serves the large majority of people in Diwania Province. The study subjects were recruited over a period of ten months from 1st of March 3[1st] of December 2014. They were matched with two groups of healthy non-diabetic men. Ethical clearance and Informed consent was obtained. The nature of the procedures had been fully explained to participants.

All study subjects were given interviewer administered questionnaires that included information on data, duration and treatment type of DM. The presence of hypertension and its treatment type, history of present/prior usage of the statin or other lipid lowering drugs. 10 ml of venous blood were collected from each patient and control subject after overnight fast and not consuming anything that morning. The blood allowed to clot and then centrifuged at room temperature. Sera were separated and either analyzed immediately or stored for later analysis within 2-day. All the parameters under investigation were determined in the serum of the subjects using commercially available reagent kits. TC,HDL-C, TG were estimated using kits from bioMerieux, France. LDL-C and VLDL-C were calculated using Friedewald equation [10]. FBS was estimated immediately by using kit from bioMerieux.HbA1c estimated by using Ion exchange chromatography. For serum lipid reference level National Cholesterol Education Programmed (NCEP) Adult Treatment Panel III (ATP III) guideline was referred [11].

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. $P<0.05$ was considered statistically significant.

Results

The biographical results of patients enrolled in this study showed in **Table 1**, in form of number of patients, median age and clinical reading of all patients. The present data showed that the non-diabetics glycated hemoglobin values were 5.4 and 5.5 for the two normal control groups 1 and 2 respectively. No significant differences

existed between the two groups except a higher serum total cholesterol (P<0.05 and 0.025 respectively) seen in the older group (group 2). The two groups of diabetics (Type 1 and 2) showed a general trend of higher serum lipids than their normal controls. However, only some of the values reached significant levels. There was no correlation between glycated hemoglobin and other serum parameters as in **Table 2, 3**.

Table 1.

The number, age range and clinical notes of all participants involved in the study

	No.	Age range (yrs)	Clinical notes
A. patient			
1- Type 1 diabetes mellitus			
Well controlled	14	17-38	2with hypertension
Poorly controlled	22	13-60	4 with UTI and normal renal function
2- Type 2 diabetes mellitus			
Well controlled	20	41-65	6 with hypertension and 2 with retinopathy
Poorly controlled	28	35-65	6 with hypertension, 2 with chest pain, 2 with hypertension and ECG changes and retinopathy,2 with retinopathy.
B. Non diabetics			
Group 1 for type 1 DM	36	15-60	
Group 2 for type 2 DM	24	32-65	

Table 2.

Glycated hemoglobin and lipid in 36 men with type 1 DM of different metabolic state and 36 non diabetic normal control subjects (mean ± SD).

Metabolic state	Glucose	TC	LDL-C	HDL-C	LDL-C/HDL-C	TG	Hb A1c%
Well controlled (N=14)	104*** ±22.1	200** ±24.2	100 ±17.9	48 ±11.9	2.0 ±0.5	273.6*** ±86.1	5.2** ±40.9
Poorly controlled (N=22)	233*** ±95.8	171 ±53.1	103 ±53.9	46 ±8.9	2.2 ±1.8	112 ±63.8	10.4***A ±165.8
Non diabetics (N=36)	82 ±9	146 ±24.0	84.5 ±23.0	47 ±10.1	1.7 ±0.8	66.5 ±22.2	5.4 ±28.0

*P value <0.01,**P value<0.001,***P value<0.0005 as compared to the non-diabetic.
A: there is a significant difference between the subgroups at P value < 0.0005.

Table 3.

Glycated hemoglobin and lipids in 48 men with type2 DM of different metabolic state and 24 non diabetic control subjects (mean ± SD).

Metabolic state	Glucose	TC	LDL-C	HDL-C	LDL-C/HDL-C	TG	Hb A1c%
Well controlled (N=20)	206*** ±81.9	208.2* ±52.1	120.1 ±46.8	36.6** ±8.5	3.2* ±1.2	281.9** ±183.9	5.3 ±54.8
Poorly controlled (N=28)	216*** ±64.7	179 ±23.9	112.9 ±29.1	33.5** ±9.7	3.3* ±1.6	193*** ±93.8	8.1***A ±65.8
Non diabetics (N=24)	81.1 ±12.1	163.7 ±28.7	100.8 ±21.9	47.8 ±9.1	2.1 ±0.6	78.9 ±29.7	5.5 ±26.9

*P value <0.01, **P value < 0.001, ***P value < 0.0005 as compared to the non-diabetic.
A: there are significant differences between the subgroups at P value < 0.0005.

Discussion

The present is study focus on the dyslipidemic pattern and its relation with glycated hemoglobin in diabetic Iraqi men. The results revealed that there is an overall elevation in serum lipids which is consistent with other studies [12, 13, 14]. The poorly controlled patient had markedly elevated glycated hemoglobin as compared to the controlled patient or to the non-diabetics. This is similar to those reported by others [15, 16]. Variation in the metabolic control brought about different pictures of serum lipid (table 2 and 3). However type 2 DM was reported to selectively lower HDL-C17,18 and as evident from the present results this had resulted in an increase in the ratio of serum LDL-C to HDL-C which is believed to impose a high risk of premature atherosclerosis and ischemic heart disease19and this is in agreement with other studies [20, 21]. The TC/HDL-C ratio is a sensitive and specific index of cardiovascular risk [20]. Apart from HDL-C, the ratio of TC/HDL-C is regarded as a predictor of CHD risk, especially with values > 6.0 [21]. The striking finding in this study is the higher serum triglycerides seen in the well than the controlled patients of both types of diabetes. Insulin over dosage in type1 and elevated endogenous plasma insulin in type 2 were postulated to be cause of hypertriglyceridemia [22, 23]. It may also be permissible to attribute the relatively lower glycated hemoglobin in the well-controlled patients than their normal non diabetic controls to this point. However this is to be confirmed. High TG levels cause increased transfer of cholesteryl esters from HDL-C and LDL-C to very VLDL-C via cholesteryl ester transfer protein, thus forming cholesteryl ester depleted, small dense LDL-C particles. These small dense lipoprotein particles are taken up by arterial wall macrophages, resulting in atherogenesis [24]. Diabetic

hypertriglyceridemia has also been suggested to be an index to discriminate between diabetic's patients with atherosclerosis and those without it [25]. Poor metabolic control in type1 diabetics had resulted in a significantly higher glycated hemoglobin concentration than the corresponding group in type 2diabetics. This implies a higher fluctuation in serum glucose in type1 than type 2 diabetes.

In contrast to some reports [22] no correlation between glycated hemoglobin and other serum parameters could be noticed in the present study. This is similar to what was found in black men [26]. The question whether the race is only factor that affects this point remains to be answered.

In conclusion, we can say according to the available data that elevated serum lipids were seen in both types of diabetes. Serum triglyceride was more affected than other lipid and it was higher in the well-controlled than the poorly controlled patients in both types of diabetes.

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Muthanna Medical Journal
ISSN: 2410-4590 (online)
2226-146x (print)

Official Journal of
Muthanna University
College of Medicine