The Lipid Profile in Children with Type 1 Diabetes Mellitus in Erbil Governorate

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ABSTRACT:
BACKGROUND:
Diabetes Mellitus is the most common endocrine-metabolic disease in children. Diabetic patients with hyperlipidemia frequently develop atherosclerosis which is an important cause of morbidity and mortality.
OBJECTIVE:
The aim of this study was to evaluate serum lipids total serum cholesterol, total serum triglyceride (TGs), High density lipoprotein (HDL-C), Low density lipoprotein (LDL-C) and very low density lipoprotein (VLDL-C) in children with type-1 diabetes mellitus in comparison with controls, and to determine the relationship of lipid profile with gender, body mass index (BMI) and duration of diabetes among patients.
METHODS:
In this case-control study, the lipid profiles of 52 patients aged 6-18 years (27 males 25 females) with established type 1 diabetes were compared with those of 52 healthy controls of the same age and gender from the first of December 2007 to the 29th of February 2008.
RESULTS:
The lipid profiles of patients with type 1 diabetes mellitus showed the following values, the mean total serum cholesterol 175 ± 55 mg/dl, total serum TGs 140 ± 135 mg/dl, HDL-C 59 ± 19 mg/dl, LDL-C 93 ± 51 mg/dl and that of VLDL-C 23 ± 13 mg/dl, whereas for the controls they were 136 ± 34 mg/dl, 74 ± 25 mg/dl, 53 ± 15 mg/dl, 68 ± 30 mg/dl and 15 ± 5 mg/dl respectively.
CONCLUSION:
The abnormalities in lipid profile regarding total serum cholesterol, total serum TGs, LDL-C and VLDL-C showed that they were significantly higher in diabetic patients than in control group, while HDL-C although it was higher among diabetic patients, but it was not statistically significant. Total serum TGs was significantly increased with the duration of diabetes.
KEYWORDS: diabetes mellitus-lipid profile-BMI.

INTRODUCTION:

Diabetes mellitus (DM) is a common, chronic, metabolic syndrome characterized by hyperglycemia as a cardinal biochemical feature. The major forms of diabetes are divided into those caused by deficiency of insulin secretion due to pancreatic ß-cell damage (type 1 DM), and those that are a consequence of insulin resistance occurring at the level of skeletal muscle, liver, and adipose tissue, with various degrees of ß-cell impairment (type 2 DM) [1].

The incidence of type 1 diabetes varies regionally and appears to be escalating. In Finland the disease incidence is 40/100,000 per year, but it is much lower in the Zunyi region of China (0.1/100,000). Based on recent trends, the incidence of type 1 diabetes is projected to increase 40% between 1997 and 2010 [2].

The global incidence of type 1 diabetes in children and adolescents is increasing with an estimated overall annual increase of around 3% [3,4]. Lipid disorders or hyperlipidemia is common in diabetic patients [5]. Hyperlipidemia is a generalized disease of the arterial wall, which may progress or regress depending on a plethora of factors. The classic risk factors for hyperlipidemia or atherosclerosis in the general population are age, male gender, family history of premature cardiovascular disease (CVD), DM, hypertension, smoking, high LDL-C, low HDL-C, and obesity [6,7]. Well-controlled type 1 diabetes is not associated with gross blood lipid disturbances when examined by conventional fasting blood sampling and analysis [8] the lipid profile in children is not well documented in north of iraq.this case control study aimed to determine lipid profile in type 1 diabetic patients and its relation to gender, body mass index and duration of diabetes in children.

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PATIENTS AND METHODS:

This case control study was conducted in a period of three months from the 1st of December 2007 to the 29th of February 2008.All cases of type 1 diabetes mellitus aged 6 – 18 years who attended and registered as type 1 diabetes in Diabetic Association Center in Erbil Governorate (North of Iraq) and they were under conventional insulin therapy .The number of cases were 52 (27 male and 25 female).

A group of control matched for age and gender were selected from three schools chosen by simple random sampling, after taken permission from diabetic association centre in Erbil and written consent taken from children's family, venous blood samples were obtained after 12 hours of fasting state. In addition, patients were instructed to avoid insulin intake for more than 2 hours before the examinations.

Blood samples were collected between 8:30-9:00 a.m., about 4 ml of blood was withdrawn by venepuncture, using plain tubes. The serum was separated by centrifuge of 5000 rpm speed for 10 minutes. Then processed immediately for measuring serum cholesterol, serum TGs , HDL-C , then LDL-C was derived by Fredrickson-Friedwald formula [LDL-C=(TC-HDL)-TG/5 VLDL = S.TGs / 5] [1], and fasting blood sugar by autoanalyser which made in French (open , automated , discreate , random access) BMI is used as a measure of overall obesity and was calculated:

BMI = weight (kg)/[height (m)] 2

Obese = BMI for age ≥ 95th percentile

Overweight =BMI for age ≥ 85th and < 95th percentiles

Normal =BMI for age ≥ 5th and <85th percentiles (1). Data were entered into Statistical Package for Social science (SPSS) program for Windows version 15. Quantitative variables were summarized by finding mean ± SD.

Mann Whitney U test was used to test the difference in the mean between cases and control.

RESULTS:

Table 1 The age group and gender of the patients and controls are distributed as shown in table 1 which shows 40/52(77%) in the age of 13-18 years and 12/52(23%) in the age groups of 6-12 years ,male constitute 27/52 (52%) and female 25/52 (48%) in both patients and control group. Table2 Overweight and obesity were found in 7(14%) of patients and 10(19%) of control and it statistically not significant as in table 2. Table 3 Table 3 shows, the duration of diabetes was >5 years In 54% of the patients while in 46% of them the duration was ≤5 years.

Table 4 The mean age of patient's and controls were the same (15 ± 3)years , the mean weight of patients was (46± 16) Kg while in controls was 49± 16Kg and the mean height of patients was (145 ± 18) cm while in controls was (151 ± 14) cm . The values of serum cholesterol, serum TGs, LDL-C and VLDL were found to be significantly higher in the patients with diabetes mellitus compared with controls.

The difference in HDL-C was not statistically significant. Table 5 Despite that the mean serum cholesterol, s.TGs, LDL-C and VLDL-C were higher in female, these results were of no significant relationship, while HDL-C result was equal between male and female patients as shown in table 5.

Table 6 The mean fasting s.TGs was significantly high among patients with duration of diabetes of ≥5 years while total fasting s.cholesterol, LDL-C , HDL-C VLDL-C were of no significant relationship with duration of diabetes mellitus as in table 6. Table 7 No significant relationship was noted of total fasting s. cholesterol, s. TGs, HDL-C, LDL-C and VLDL-C with BMI among diabetic patients as in table 7.

Table1: Age and gender distribution of the patients and controls.

Age and Gender	Patients(52) No. and %	Controls(52) No. and %
6-12years	12(23%)	12(23%)
13-18years	40(77%)	40(77%)
Male	27(52%)	27(52%)
Female	25(48%)	25(48%)

Table 2: Body Mass Index distribution of Patients and controls

Duration (years)	No.	Percentage
≤5	24	46%
>5	28	54%
Total	52	100.0

P > 0.05(Not significant)

Table3: Duration of DM in 52 patients

Body Mass Index	Patients(52) No. and %	Controls(52) No. and %	P-value
< 25	45(87%)	42(81%)	0.59
≥ 25	7(14%)	10(19%)	
Total	52	52	

Table4: The distribution of mean ± standard deviations of various variables in patients with diabetes mellitus and controls.

Variables	Patients with DM Mean ± SD	Controls Mean± SD	P-value
Body Mass Index	21 ± 4	21 ± 5	0.59*
Duration of DM (years)	6 ± 2		
S. cholesterol (mg/dl)	175 ± 55	136± 34	0.01 ***
S.TGs (mg/dl)	140 ± 135	74 ± 25	0.00 ***
HDL-C (mg/dl)	59 ± 19	53 ± 15	0.52 *
LDL-C (mg/dl)	93 ± 51	68 ± 30	0.02 **
VLDL-C (mg/dl)	23± 13	15± 5	0.01 ***

*p > 0.05(Not significant)
**p < 0.01(Significant)
***p < 0.001(Highly significant

Table 5: Relation of Lipid Profile of patients With Gender

Lipid Profiles	Range	Male	Female	Total	P-Value
Total Serum Cholesterol	Normal 5-95th percentile	21(78%)	18 (72%)	39	0.66
	More than 95th percentile	6(22%)	7(28%)	13	
Total Serum Triglyceride	Normal 5-95th percentile	20(74%)	14(56%)	34	0.17
	More than 95th percentile	7(26%)	11(44%)	18	
HDL_C	Normal 5-95th percentile	25(93%)	23(92%)	48	0.93
	More than 95th percentile	2(7%)	2(8%)	4	
LDL_C	Normal 5-95th percentile	25(93%)	21(84%)	46	0.33
	More than 95th percentile	2(7%)	4(16%)	6	
VLDL_C	Normal 5-95th percentile	25(93%)	20(80%)	45	0.18
	More than 95th percentile	2(7%)	5(20%)	7	

p > 0.05 (not significant)

Table 6: Relation of Lipid Profile and Duration of Diabetes Mellitus

Lipid Profiles	Range	duration of DM		Total	P-Value
		5 years or less	More than5 years		
Total Serum Cholesterol	Normal 5-95th percentile	21(88%)	18(64%)	39	0.10
	More than 95th percentile	3 (12%)	10 (36%)	13	
Total Serum Triglyceride	Normal 5-95th percentile	20(83%)	14(50%)	34	0.02
	More than 95th percentile	4(17%)	14(50%)	18	
HDL_C	Normal 5-95th percentile	17(71%)	21(75 %)	38	0.97
	More than 95th percentile	7(29%)	7(25%)	14	
LDL_C	Normal 5-95th percentile	23(96%)	23(82%)	46	0.26
	More than 95th percentile	1(4%)	5(18%)	6	
VLDL_C	Normal 5-95th percentile	22(92%)	23(82%)	45	0.55
	More than 95th percentile	2(8%)	5(18%)	7	

P > 0.05 (not significant)

Table 7: Relation of Lipid Profile in Type I Diabetes Mellitus with BMI .

Lipid Profile	Range	BMI		Total	P-Value
		Less than 25	25 and more		
Total Serum Cholesterol	Normal 5-95th percentile	32(71%)	7(100%)	39	0.22
	More than 95th percentile	13(29%)	0(0%)	13	
Total Serum Triglyceride	Normal 5-95th percentile	28(62%)	6(86%)	34	0.44
	More than 95th percentile	17(38%)	1(14%)	18	
HDL_C	Normal 5-95th percentile	31(69%)	7(100%)	38	0.18
	More than 95th percentile	14(32%)	0(0%)	14	
LDL_C	Normal 5-95th percentile	39(88%)	7(100%)	46	0.80
	More than 95th percentile	6(13%)	0(0%)	6	
VLDL_C	Normal 5-95th percentile	39(87%)	6(86%)	45	1.32
	More than 95th percentile	6(13%)	1(14%)	7	

p > 0.05(Not significant)

DISCUSSION:

Patients with Diabetes mellitus can have many lipid abnormalities, including elevated levels of total serum cholesterol, serum triglycerides , LDL-C ,VLDL-C and low level of HDL-C especially if the blood sugar uncontrolled. These patients have a preponderance of abnormalities in the composition of LDL-C, which increase atherogenicity even if the absolute concentration of LDL-C is not significantly increased .The combination of elevated levels of LDL-C particles and high triglyceride levels represents a lethal cholesterol abnormality [7]. In the present study most of the patients 40 (77%) were 13-18 years of age, this could be explained that generally, the incidence of type 1 diabetes mellitus is age-dependent with a range of fewer than 1 per 1000 at age 5 years to approximately 3 per 1000 at age 16 years , Incidence increases with age and peaks in early to middle puberty [9,] but IDDM can occur at any age [10] . Regarding the gender, in this research we found that 27 (52%) of patients were male and 25(48%) were female; this could be explained that male and female subjects are approximately affected [9.] In the present study, 45 (87%) of patients were less than 25 BMI and 7 (14%) patients were more than 25 BMI in comparison with the results of the control 42(81%) were less than 25 ,and 10(19%) were more than 25, although this difference was not statistically significant(P =0.59). Weight loss could be due to insulin deficiency which cause breakdown of protein and fat [10]. The mean fasting serum cholesterol, serum TG.s, LDL-C and VLDL-C ratio, were significantly higher among diabetic patients than in controls. This is concordance with other studies conducted elsewhere like Al-Naama et al in Basrah –Iraq [11], Khalil et al in Amman-Jordan [7.]and Erciyas et al in Amsterdam-Netherlands [12]. But in contrast

to Imani et al in Isfahan-Iran who showed surprisingly, lower serum cholesterol , LDL-C in diabetic patients , and this difference could be due to tight nutritional control in diabetic group -as the authors attributed in the study [13] In this study, HDL-C was higher among patients than controls, although this difference was not significant statistically (P = 0.97).This result is in consistent with the finding of Al-Naama et al [11], and in contrast to other studies like, Khalil et al [7]. , Imani et al and Erciyas et al studies [12 13] .The results of our study and Al-Naama et al study are in agreement with the belief that the level of the HDL-C is normal or increased in type 1 DM [14]. Despite that the mean serum cholesterol, serum TGs, LDL-C , VLDL-C were higher in female while HDL-C was equal in male and female patients ,all these results were statistically of no significant relationship.This is in concordance with the finding of Patiakas et al in Greece study, who stated that there was no important statistical difference between male and female in hypertriglyceridemia and mixed hyperlipidemia [15],but in contrast to the results reported by Perez et al in Barcelona-Spain who showed that female with type 1 diabetes displayed higher concentrations of LDL-C and a higher prevalence of hypercholesterolemia when glycemic control was poor, and the results were statistically significant [16] ,This difference of results could be due to the difference in the sample size and age group between both studies. Despite that the mean fasting serum cholesterol, LDL-C, HDL-C and VLDL-C were higher in diabetic patients, but these differences were not statistically significant among patient with diabetes in relation to the duration of disease , whereas the result showed significant difference in the mean serum TGs (P = 0.02) which was higher among patients with duration more than 5 years. This could be explained by the most common pattern of dyslipidemia is hypertriglyceridemia [17] and no further Studies have been found between the duration of diabetes and lipid disorders. The mean fasting serum cholesterol, serum TGs, LDL-C, HDL-C and VLDL-C were not influenced significantly by BMI among the patients .These results were in concordance with the reports of Bianga et al in Japanese study [18] and Herbert et al in Philippine study [19] .

CONCLUSIONS:
It was concluded that the lipid abnormalities (total fasting serum cholesterol, serum TGs, LDL-C,VLDL-C) were significantly higher in diabetic patients than in control group, while HDL-C, although was higher in diabetic patients, but it was not statistically significant.

There was no relationship between the lipid abnormalities in diabetic patients and the gender, BMI, and duration of diabetes, except that the s. TGs was significantly higher in patients of more than 5 years duration.

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