LIPID PROFILE OF CHILDREN WITH TYPE I DIABETES COMPARED TO CONTROLS

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Abstract

INTRODUCTION: Diabetes mellitus in the most common endocrine-metabolic disease in children and is associated with cardiovascular disease risk factors. This study aimed to compare the lipid profile of diabetic children with controls.

METHODS: In this case-control study, the lipid profiles and lipoprotein levels of 45 children aged 2-18 years with established diabetes were compared with those of 45 healthy controls.

RESULTS: Mean apolipoprotein A and triglyceride levels in the cases were higher in than in controls, while mean apolipoprotein B and lipoprotein a, as well as total, LDL and HDL cholesterol were higher in controls.

CONCLUSIONS: Better apolipoprotein levels and lipid profiles in diabetic children as compared to controls were likely due to tight nutritional control in diabetic patients under study.

Key Words: Diabetes mellitus, lipid profile, apolipoproteins, children.

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Introduction

Diabetes mellitus (DM) is the most common endocrine-metabolic disease in children and adolescents. In its insulin-dependent type (IDDM), severe decreases in insulin levels cause various short- and long-term complications, namely increased risk of dyslipidemia and atherosclerosis.

Poor glycemic control in IDDM can lead to decreased HDL-C (high-density lipoprotein cholesterol) and increased LDL-C (low-density lipoprotein cholesterol) and triglyceride (TG) levels.[2] Coronary heart disease (CHD) occurs earlier and more frequently in diabetics than in non-diabetics.[3,4] Abnormal lipid profile and lipoprotein oxidation (especially LDL-C) are more common in diabetic patients and are aggravated with poor glycemic control. LDL oxidation causes cytotoxic reactions and increases the risk of atherogenesis. Some studies suggest that abnormal lipid profile is also involved in the development of microvascular complications.[5,6] HDL-C is produced in the liver and intestines from phospholipids and apolipoproteins. Cholesterol exits the cells via HDL-C.[7] Lipoprotein-a (Lpa) is a type of LDL-C which interferes with fibrinolysis, in turn causing disorders of plasminogen activity and fibrinolysis.[8]

Considering the probable disorders of lipid profile and aggravation of the atherosclerotic process in high-risk patients, we conducted this study to assess the lipid profile of children and adolescents with IDDM in our community and compare them with controls.

Materials and methods

In this case-control study, known cases of IDDM aged 2-18 years, were selected from among patients referred to Isfahan Endocrinology and Metabolism Research Center as the case group. Age- and sex-matched controls were selected from among healthy children of families living in the same neighborhood as the case group.

Children with hypothyroidism, cholestatic hepatitis, familial hypercholesterolemia, nephrotic syndrome, chronic renal failure, and those receiving medications like thiazides, betablockers, oral estrogen and/or clozapine were excluded from the study. Before inclusion in the study, DM was ruled out in the control group by asking questions about the clinical signs of diabetes such as polyuria, polydipsia and recent weight loss; laboratory tests also confirmed the absence of DM in the control group.

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TABLE 1. Comparison of biochemical factors of diabetic children and controls

	Diabetic children, (n±45) Mean ± SD	Control, (n±41) Mean ± SD	P
ApoA	137.4±21.2	137.1±31.2	0.965
ApoB	88.3±26.0	105.1±20.8	0.001
Lpa	31.5±15.6	66.8±72.9	0.002
LDL-C	100.5±24.2	107.9±25.6	0.02
HDL-C	41.8±9.8	49.9±9.7	0.001
Total cholesterol	159.6±35.5	181.3±31.5	0.003
TG	125.1±64.6	120.9±44.1	0.72

Apo: apolipoprotein
Lpa: lipoprotein a

TABLE 2. Frequency of low HDL-C, High HDL-C, High LDL-C, High total cholesterol and high triglycerides in the two groups

	Diabetics N (%)	Controls N (%)
Low HDL	16 (35.6)	1 (2.4)
High LDL	4 (8.8)	5 (12.2)
High total cholesterol	3 (6.7)	5 (12.2)
High triglycerides	20 (44.4)	16 (40)

HDL-C: high-density lipoprotein cholesterol
LDL-C: low-density lipoprotein cholesterol

In both groups, venous blood samples were obtained after 12 hours in fasting state. Serum cholesterol, triglyceride, LDL-C, HDL-C, Apolipoprotein B_{100} ($ApoB_{100}$), Apolipoprotein A_1 ($ApoA_1$) and Lpa were analyzed at Isfahan Cardiovascular Research Center and were compared between the case and control groups. The collected data were analyzed using SPSS V13/Win and the means of variables were compared with Student's t-test. The frequency of lipid disorders in the case and control groups was compared with chi square test.

Results

The study population consisted of 45 known cases of IDDM aged 2 to 18 years, and 41 healthy controls. The means of ApoA and triglyceride in the case group were higher than controls, but the means of ApoB, Lpa, cholesterol, LDL-C and HDL-C in the control group were higher than cases (Table l).

Table 2 shows the frequency of low HDL-C, high LDL-C, high total cholesterol and high TG in the two groups. It shows that the frequency of low HDL-C and high TG was higher in the case group and the frequency of high TG was higher in controls. Dyslipidemia was more prevalent in diabetic children than in controls (52.9% vs. 47.1%, respectively, P<0.0001).

Discussion

We found significant difference between ApoB, Lpa, HDL-C and total cholesterol levels between the case and control groups.

Surprisingly, mean levels in diabetic children were lower than in controls.

These findings are contrary to many previous studies. The study of Erciyas et al. showed that ApoA and ApoB, as well as total and LDL cholesterol in diabetic children were significantly higher than in controls.[9]

The case-control study of Bustos et al. showed that diabetic children had significantly higher Lpa-1 levels than controls.[10]

In our study, we could not measure the sub-fractions of Lpa, but mean Lpa level was significantly lower in diabetic children. In a recent study in Kuwait, ApoA and ApoB levels in diabetic children were significantly higher than in controls.[11]

In our study, ApoB in the control group was significantly higher than in diabetic children.

Consistent with the study of Ohta et al.,[12] plasma levels of HDL-C in diabetic children in our study were significantly higher than controls.

Our observation of lower mean levels of some serum lipids was apparently due to tight nutritional control in the diabetic group.

References

1. Nelson textbook of Pediatrics: from WB Saunders company; USA 2004; 1967-9.
2. Tso TK, Snook JT, Lozano RA, Zipf WB.Risk factors for coronary heart disease in type 1 Diabetic children: the influence of apoE phenotype and glycemic regulation. Diabetes Res and clin pract 2001; 54(3):165-71.
3. Jarrett RJ. The epidemiology of coronary heart disease and related factors in the context of diabetes mellitus, and impaired glucose tolerance. In: Jarrett RJ, ed. Diabetes and heart disease, Amsterdam. Elsevier 1984; 1-23.
4. Kannel WB, Mc Gee DL. Diabetes and glucose tolerance as risk factors for cardiovascular disease in Framingham study. Diabetes Care 1979;2:920-926.
5. Kordonouri 0, Danne T, Hopfenmuller W, Enders I, Hovener G, Weber B. Lipid profile and blood pressure: are they risk factors for the development of early background retinopathy and incipIent nephropathy in children with insulin-dependent diabetes mellitus. Acta Paediaterica 1996;85:43-8.
6. Sjolie AK, Stephenson J, Aldington S, Kohner E, Janka H, Stevens L et al, and the EURODIAB IDDM complications study Group. Retinopathy and vision loss in insulin-dependent diabetes in Euroup. The EURODIAB IDDM complications study. Ophthalmology 1997; 104:252-60.
7. Sanholzer C, Sana N. Apo A isoforms predict risk for coronary heart disease. A study in six populations. Arteriosclerosis 1992;12:1214-7.
8. Supeko Hr. Beyond LDL cholesterol reduction. Circulation 1996;94:2351-5.
9. Fusun Erciyas, Fatma Taneli, Bana Arslan, Yasemin Uslu. Glycemic control, oxidative stress and lipid profile in children with typel diabetes mellitus. Archives of medical Research 2004;134- 140.
10. Bustos P, Radojkovic C, Ulloa N, Munoz M, Martinez A, Calvo C, Asejo S. Lipoprotein composition in children and adolescents with type 1 diabetes mellitus. J Pediatr Endocrinal Metab 2005;18(3):257-64.
11. Moussa MA, Alsaeid M, Abdella N, Refai TM, AI-Sheikh N, Gomez JE. Lipoprotein (a) and other cardiovascular metabolic risk factors in Kuwaiti children with type-l diabetes. Ann Nutr Metab, 2004; 48(5):329-34.
12. Ohta T, Nishiyama S, Nakamura T, Saku K, Maung KK, Mtsuna I. Predominance of large low density lipoprotein particles and lower fractional esterification rate of cholesterol in high density lipoprotein in children with insulin-dependent diabetes mellitus. Eur J Pediatr. 1998; 157(4):276-81.