

A Prospective Analysis of Lipid Profile in Children with Type 1 Diabetes in a Tertiary Care Hospital

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ABSTRACT

Background: Dyslipidaemia is a significant risk factor for coronary heart disease which may lead to an increased risk of atherosclerosis in Type I diabetes mellitus at a younger age.

Methods: This prospective study was conducted in the department of Biochemistry and Paediatrics at Gold Field Institute of Medical Sciences & Research, Faridabad. Twenty children with type 1 diabetes mellitus were enrolled on the basis of inclusion and exclusion criteria and were assessed for the levels of glucose, total cholesterol, triglycerides, High Density Lipoprotein, Very Low Density Lipoprotein, Low Density Lipoprotein and cholesterol to HDL ratio and were compared with same number of matched healthy controls of similar age.

Results: The result of the present study showed that all the above mentioned parameters were significantly ($P < 0.001$) higher in type 1 diabetes mellitus as compared to the control group with glucose levels of 207.6 mg/dl, triglycerides levels of 210 mg/dl, cholesterol levels of 250 mg/dl, VLDL levels of 45 mg/dl, LDL levels of 172 mg/dl and cholesterol to HDL ratio of 7.8 whereas HDL levels were significantly lower i.e. 31.2 mg/dl in Type 1 Diabetes Mellitus. **Conclusions:** The patients are at a higher risk of developing atherosclerosis and dyslipidaemia at an early age.

Key words: Type 1 Diabetes, Dyslipidaemia, Low Density Lipoprotein, High Density Lipoprotein

INTRODUCTION

Type 1 diabetes also known as juvenile diabetes or Insulin Dependent Diabetes Mellitus, is widely thought to be an organ specific autoimmune disease. Type 1 Diabetes is characterized by an inadequate secretion of insulin by the β -cells of pancreas and usually has a sudden and dramatic onset, ketoacidosis, and insulin dependency at a relatively early age.^[1]

The incidence of Type 1 Diabetes Mellitus has increased globally over the past decades. It has been estimated that on an annual basis some 65,000 children aged less than 15 years develop Type 1 Diabetes Mellitus.^[2]

Increased blood sugar levels also result in significant disturbance in lipid metabolism including both qualitative and quantitative change in the lipids.^[3] Type 1 diabetes is associated with at least a 10-fold increase in cardiovascular disease as compared with an age-matched Non-diabetic population.^[4] Dyslipidemia has been shown to be a significant coronary heart disease risk factor in Type 1 Diabetes.^[5,6]

Although, diabetes implies a relatively poor prognosis for the individual developing the disease, there is a distinct prospect of significant improvement in prognosis with the implementation of effective existing strategies including screening for risk factors, which should include determination of lipid profile.^[7]

The American Heart Association categorizes children with Type 1 Diabetes Mellitus are at risk of cardiovascular and recommends healthy lifestyle and pharmacological treatment for those with elevated LDL cholesterol levels.^[8,9] Thus, it seems important to pay attention to lipid

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abnormalities, in patients with Type 1 Diabetes, in order to reduce cardiovascular disease in this population at an early age.^[10]

METHODS

The study was conducted in the Department of Biochemistry in association Paediatrics Department at Gold Field Institute of Medical Sciences & Research, Faridabad. The study was approved by the Institutional Ethics Committee. A total of 20 Diabetic patients during the 1 year study (from April 2011 to March 2012) from the Out Patients Department of the Paediatrics were selected on the basis of inclusion and exclusion criteria. A group of healthy subjects with age and sex matched controls were selected.

Inclusion criteria:

The study subjects, who underwent a detailed medical examination, was diagnosed Type I Diabetes Mellitus for more than one year and no signs of acute or chronic illness.

Exclusion criteria:

Children with chronic illnesses and cardiovascular disease were excluded. All patients with any renal dysfunction, (i.e. raised blood urea and serum Creatinine levels), with coexistent illness (i.e. infections), liver diseases, were excluded. None of the subjects were taking antihypertensive or lipid lowering medications at the time of the study.

The subjects were divided into the following 2 groups: Group I healthy Children without Type 1 DM (n=20). Group II Children with Type 1 DM (n=20).

Blood was collected from the arm veins of patients between 8 and 10am following overnight fast. Serum glucose levels were determined by the glucose oxidase method. Fasting lipid profile for each subject was obtained by measuring serum triglycerides (TAG) by acetyl acetone method; Total cholesterol was measured by Parekh and Jung method and HDL Cholesterol by Phosphotungstate method.^[11]

Low density lipoprotein (LDL-C) and Very low density lipoprotein cholesterol (VLDL-C) were measured using the Friedewald equation: [LDL chol]= [Total chol]- [HDL chol] - [Triglycerides/5], while VLDL- C was calculated from the formula VLDL-C = TG / 5. Cholesterol to HDL Ratio was estimated by using formulae Total Cholesterol/ HDL Cholesterol.

Statistics:

Mean and standard deviations were determined for quantitative data. The significance of differences among the two groups was analyzed by student's t-test. P value < 0.001 was considered statistically significant.

RESULTS

The mean±SD values and p-values of biochemical parameters were performed in the control and diabetic groups (Table 1). Mean Blood Glucose, Total cholesterol, VLDL-cholesterol were significantly higher in diabetic

children than control group. Serum LDL-cholesterol and HDL-Cholesterol levels were also statistically significant. Al-Naama LM, et al showed that mean total cholesterol, HDL-C, LDL-C, VLDL-C, LDL-C / HDL-C ratio were significantly higher in diabetic children compared to the control group (P<0.02 to <0.0001), whereas TG level was higher in diabetic children compared to the control, but the difference was statistically marginally significant (p 0.06).^[7]

Table: Biochemical parameters.

Parameters	Group I Control	Group II Type 1 diabetes	't' Value	'P' Value
Blood glucose (mg/dl)	85.8±11.05	207.5±32.9	18.94	P<0.001
Cholesterol (mg/dl)	149±16	250±10.83	9.22	P<0.001
Triglycerides (mg/dl)	78.2±23.4	210 ±30.42	10.19	P<0.001
HDL (mg/dl)	42.08±4.06	31.2±7.60	5.42	P<0.001
LDL (mg/dl)	91.96±15.68	172±14.23	6.64	P<0.001
VLDL (mg/dl)	15.36±4.73	45±6.1	10.08	P<0.001
Cholesterol/HDL L ratio	3.595±0.53	7.8±1.49	7.19	P<0.001

This is in agreement with our present study in which Type I Diabetic patients exhibited a significant increase in total cholesterol, Triglycerides, LDL and VLDL cholesterol as compared to the control group (P<0.001). In healthy persons, cholesterol level varies from 150 to 180mg/dl. Values around 220 mg/dl will have moderate risk and values above 240 mg/dl will need active treatment.

LDL Blood levels under 130mg/dl are desirable. Levels above 160mg/dl carry definite risk. Hence LDL is "bad" cholesterol. HDL level above 60 mg/dl protects against heart disease. Hence HDL is "good" cholesterol. A level below 40 mg/dl increases the risk of CAD. For every 1 mg/dl drop in HDL, the risk of heart disease rises 3%. If the ratio of total cholesterol/HDL is more than 3.5, it is dangerous.^[12]

This study shows that there is a decrease in HDL cholesterol and increase in Cholesterol to HDL ratio in Type 1 Diabetic patients as compared to the control group. This is similar to the trend shown by Faghih S, et al in which the mean apolipoprotein A and triglyceride levels in cases were higher than in controls, while mean apolipoprotein B and lipoprotein-a, as well as LDL, HDL and total cholesterol were higher in controls.^[13]

Coronary heart disease is the leading cause of mortality in patients with type 1 diabetes. As in persons with Type 2 Diabetes Mellitus and the general population, dyslipidemia is a considerable dangerous factor for Coronary heart disease (CHD) in type 1 diabetic patients.^[14]

CONCLUSION

In this study indicated that there is a significant increase in the level of Lipid profile, Cholesterol HDL ratio, Glucose and a decrease in HDL Cholesterol in Type 1 Diabetic patients.

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