Physiology

COMPARISION OF LIPID PROFILE IN TYPE 1 DIABETES MELLITUS AND NORMAL HEALTHY INDIVIDUALS

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INTRODUCTION
These days diabetes is a global problem. No nation or region is free of Diabetes Mellitus (DM). Diabetes mellitus is the most common endocrine-metabolic disease in children and adolescents. India now has highest number of diabetic patients in the world. Currently up to 11% of Indian urban population, 3% of rural populations above the age of 15 have diabetes. A study conducted in south India by IDDM registry group Chennai in 1995 showed that the incidence of Type 1DM in urban population was 10.5 per one lakh per year. In boys it is 12.6 per lakh per year, in girls it is 9.5 per lakh per year.[1, 2]

Type 1 DM is known to have a higher risk of atherosclerotic disease compared with that of the general population even after relative short disease duration. Hyperlipidemia is known to occur in Type 1 DM patients. Youth with Type 1 DM face long term risks of microvascular (eg-retinopathy, nephropathy and neuropathy) and macrovascular complication (cardiovascular). One descriptive study found that majority of adults who were diagnosed with type 1 DM in childhood recalled being unaware of long-term complication. It is the most common source of diabetes related fear in parents and youth.[3]

Diabetes is a major risk factor for cardiovascular diseases in patients with Type 1 DM, atherosclerosis occurs earlier in life leading to increased morbidity and mortality compared with these in the general population. Moreover, studies of the natural history of atherosclerosis development point to an origin of the lesion inchildhood and adolescent.[4]

Early detection and treatment of hyperlipidemia in Type 1 DM can prevent prognosis of lipid abnormalities and minimizes the risk for atherogenic cardiovascular disorders and cardiovascular accident.[5]

Less is known of lipid abnormalities in diabetic children, although some have shown normal values two years after diagnosis while others have shown raised high density lipoprotein (HDL) cholesterol or conversely low HDL cholesterol, the latter being associated with poor glycaemic control.[6]

Data on dyslipidemia in type 1 DM is scarce and controversial. Therefore the present study is aimed to evaluate the lipid profile changes with type 1 DM .

AIMS AND OBJECTIVES

OBJECTIVES:
To study the following parameters in the type 1 diabetic patients in the age group of 10 to 20 years.

*   Lipid profile: -Serum Total cholesterol
Serum Triglycerides
LDL –C
VLDL –C
HDL- C

To compare obtained parameters of study subjects with age matched healthy controls.

AIMS :
The present study is conducted to establish whether lipid profiles were indeed abnormal in children and adolescents with established IDDM.

MATERIALAND METHODS
This study was conducted in the department of Physiology, KIMS Hubli with the assistance of laboratory setup of the department of Biochemistry, KIMS, Hubli. Ethical approval was obtained from the ethical committee of KIMS, Hubli.

Study design Case control study

Source of data
Thirty diabetic children who had been diagnosed having type1 diabetes mellitus attending KIMS, Hubli and also diabetic clinic in Hubli and thirty healthy age matched children as controls were included in this study. The patients were selected on the basis of inclusion and exclusion criteria. A questionnaire form designed for the purpose of the study was filled by me which included age, sex, duration of diabetes, insulin therapy, complications of the disease and family history of diabetes mellitus. A thorough physical examination was carried out on each subject. Informed consent was obtained from one of the parents.

The importance of the procedure was explained to one of the parents (which was usually the mother) and the child, where appropriate and an informed consent was obtained. Children with chronic illnesses and with family of history diabetes mellitus or cardiovascular disease were excluded. For each patient and control, height and weight were measured.

Blood samples were collected from 30 Type 1 diabetes mellitus patients and 30 healthy individuals from KIMS, Hubli and also from Diabetes Clinics in Hubli. The samples were drawn between 7AM-10AM under aseptic precautions after an overnight fasting in order to avoid changes due to circadian rhythm. 2ml ofblood was c o l l e c t e d from cubital vein for lipid profile estimation. Serum was separated from blood sample by centrifugation at 3000 rpm for 10 mins

Inclusion Criteria:
*   Type 1 diabetes mellitus otherwise healthy.
*   Both males and females.
*   Age 10 – 20 years.
*   Getting Insulin treatment.

Exclusion Criteria:
*   Type 2 Diabetes mellitus.
*   Familial hypercholesterolemia.
*   Age less than 10 years and more than 20 years.
*   Significant diabetic complications like diabetic foot, and retinopathy.
*   Neuropathy.
*   Patients on lipid lowering therapy.
*   H/o smoking and alcohol intake.
*   Bad glycaemic status.

The statistical analysis was done by comparing the different groups

using student's't' test

Methods of collection of data.
- Proforma are given to all type 1DM patients.
- Written consents are obtained during the face to face questionnaire interview.
- Height and weight of each individual were recorded, BMI was calculated. Vital parameters like pulse rate, BP was recorded. A detailed examination of respiratory, cardiovascular, CNS and endocrinal examination was done.

After selecting the subjects and controls, appointment was scheduled in prior and they were requested to do an overnight fasting prior to the day of the test to get fasting blood sample for lipid profile analysis. Between 7am to 10am 2ml of venous blood was collected, in a plain bulb by venepuncture under aseptic precaution.

Serum lipid proile was analyzed in Biochemistry clinical Lab, in KIMS, Hubli, with clinical chemistry Analyzer (Type Model: XL-300 ERBA).

Very Low Density Lipoprotein (VLDL)
It is obtained by the Friedwald formula.[7]
VLDL = TG / 5

Low Density Lipoprotein (LDL)
It is obtained by the formula
LDL Cholesterol = Total Cholesterol – (HDL+VLDL).

In our study, following lipid profile values have been considered for the study group and healthy control group aged between 10 to 19 years, as suggested by the National Cholesterol Education Program's Expert Panel on Blood Cholesterol in Children and Adolescents, the acceptable level for age in between 2 to 19 years old are as follows.[8]

- Serum Total Cholesterol >170mg/dl
- Serum Triglycerides >150mg/dl
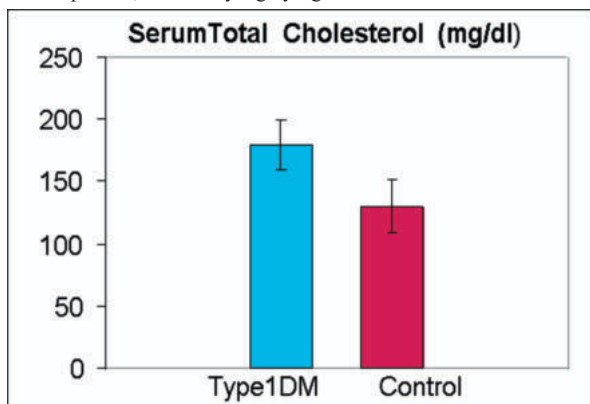- HDL-c<35mg/dl
- LDL-c>110mg/d

RESULTS

Table 1. Serum Total cholesterol (mg/dl)

Type 1 DM(mg/dl) n= 30	Control group(mg/dl) n= 30	't' value	'p' value	Significance
179.5 ± 19.38	129.8 ± 21.51	9.40	<0.0001	VHS

(mean±SD)

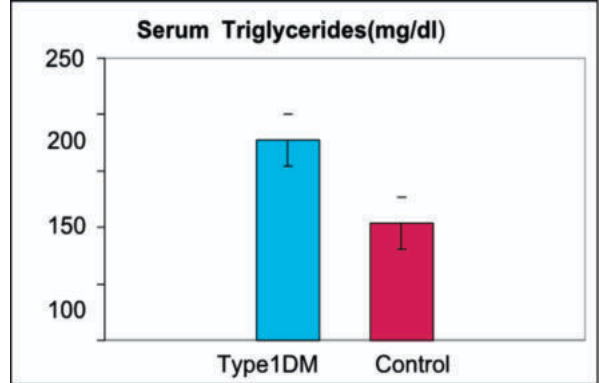n = sample size, VHS - very highly significant

Graph No 1: Serum Total cholesterol (mg/dl)

Table 2. Serum Triglycerides (mg/dl)

Type 1 DM(mg/dl) n= 30	Control group(mg/dl) n= 30	't' value	'p' value	Significance
177.4 ± 23.34	103.4 ± 23.05	12.68	<0.0001	VHS

(mean±SD)

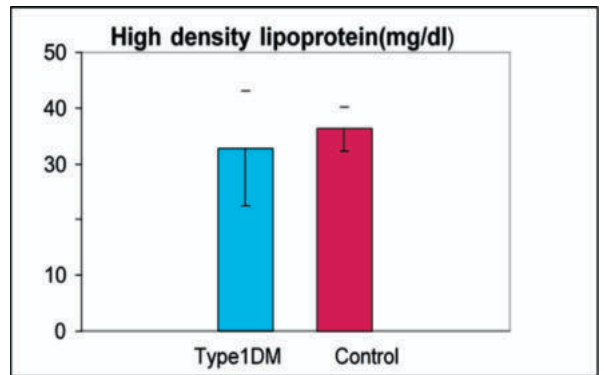n = sample size, VHS - very highly significant

Graph No 2: Serum Triglycerides (mg/dl)

Table 3. High Density Lipoprotein (mg/dl)

Type 1 DM(mg/dl) n= 30	Control group(mg/dl) n= 30	't' value	'p' value	significance
32.80 ± 10.24	36.37 ± 3.91	-1.78	<0.080	NS

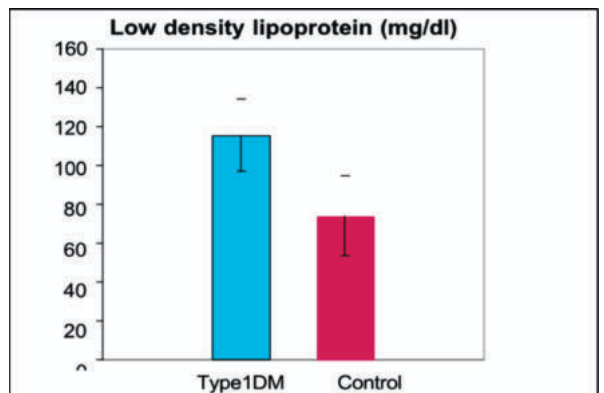(mean±SD)

n = sample size, NS - not significant

Graph No 3: High Density Lipoprotein (mg/dl)

Table 4. Low Density Lipoproteins (mg/dl)

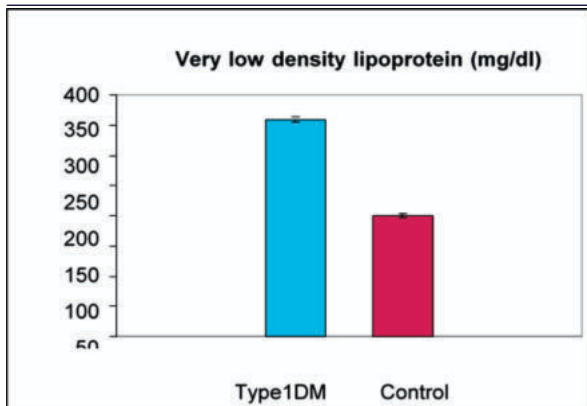| Type 1 DM(mg/dl) n= 30	Control group(mg/dl) n= 30	't' value	'p' value	significance
115.54 ± 18.63	745.33 ±20.66	8.07	<0.001	VHS

(mean±SD)

n = sample size, VHS - very highly significant

Graph No 4: Low Density Lipoproteins (mg/dl)

Table 5. Very Low Density Lipoproteins (mg/dl)

Type 1 DM(mg/dl) n= 30	Control group(mg/dl) n= 30	't' value	'p' value	significance
359.2 ± 4.9	199.9 ± 4.2	13.320	<0.0001	VHS

Graph No 5: Very Low Density Lipoproteins (mg/dl)

DISCUSSION

During one year study period, total 30 type 1 DM patients were evaluated for lipid profile, out of 30 patients 21 were females (F=70%), 9 were males (M=30%). All these patients were in the age between 10 to 19 years.

Serum Total Cholestrol:

In our study subject mean value of total cholesterol was 179.5±19.38 mg/dl and in controls it was 129.8±21.51 mg/dl. This difference is statistically very highly significant (p<0.0001).

Similar observation were made by N.P.Suryavamshi, Butey, et al, they attributed this difference in total cholesterol levels to decrease muscular exercise calorie intake or inhibition of cholesterol metabolism.[9]

Similar studies done by L. M. Al-Naama, et al, have showed that mean total cholesterol level was significantly higher in diabetic children as compared to the control group and hypercholesterolemia was present in a significantly higher number of diabetic patients as compared to the control group. Possible explanation for variation between reports include; duration and severity of diabetes, degree of glycemic control, diet, and different Laboratory methods.[10]

Anna marice Ladcia , Luis Aden, et al, also found very high prevalence of elevated level of total cholesterol especially young patients. The reason for difference in the serum cholesterol level may be due to difference in dietary habits of the people at different region.[11]

Serum Triglycerides:

In our study subject mean values of triglycerides was 177.4±23.34 mg/dl and in controls group it was 103±23.34 mg/dl .This difference is statistically very highly significant. This finding is also made by Khursheed Muhammad Uttra, Bikha Ram Devrajani et al, it has been suggested that increase in serum triglycerides may be due to insulin deficiency with results. Faulty glucose utilization, causes hyperglycemia and mobilization of fatty acids from adipose tissues are mobilized for energy purpose and excess fatty acids are accumulated in the liver can be converted in to triglycerides.[1]

Similar studies by Leticia M Alcantara, et at, found hypertriglyceridemia in 10.6% of patients with Type1 diabetes, which is similar to the frequency described in other populations. In their study, the group with higher TG levels had a higher BMI, higher A1C and used a similar insulin dose than others. This is probably associated with worse dietary habits in this group.[12]

High Density Lipoprotein-cholestrol-c:

In our study subject mean values of HDL-c was 32.80±10.24 mg/dl and in controls group it was 36.37±3.91 mg/dl. This difference is statistically not significant.

However, S.W. Masram M.V. Bimanpallli, et al, found decreased HDL-C levels in type 1 diabetic patients but it was not statistically significant The difference in the age group and different methods for HDL-C estimation are included in different studies. This indicates that HDL metabolism is not much disturbed in type 1DM.[13]

Nish.Chaturved, Jonh, et al, observed that features of HDL-C

metabolism are unaffected by diabetic complication, which may be accounted for by their relatively weak association with glycemic control.[14]

Low Density Lipoprotein-c:

In this study subject mean values of LDL-C was 115.54±18.63 mg/dl and in case group is 745.33±20.66 mg/dl. This difference is statistically very highly significant. John guy, Lorrain Ogden, et al, also found significant increase in the level of serum LDL-C in type 1 diabetic patients even after relatively short diseases duration.[4]

L. M. Al-Naama et al, observed that elevated LDL-C level was found in diabetic children only. As LDL-C level was increased in a greater proportion than that of HDL-C, in the present study, LDL-C and the LDL-C/HDL-C ratio, both generally accepted risk indicators of atherosclerosis, were found to correlate significantly with metabolic control in diabetic children. Previous reports where it was concluded that the levels of cholesterol and LDL-C increases with deteriorating metabolic regulation. The worsening of glycemic control further deteriorates lipid and lipoprotein abnormalities. Furthermore, TC and LDL-C levels are often elevated in poor glycemic control, and the compositional changes in LDL particle may further increase the risk of coronary heart diseases.[15]

Very Low Density Lipoprotein-c:

In this study subject mean value of VLDL-C was 359.2±4.9 mg/dl and in control group 199.9±4.2 mg/dl .This difference is statistically very highly significant.

N.P. Suryawanshi, A.K. Bhutey, et al, found difference in VLDL-C among diabetic group than control group they explained that insulin deficiency might be associated with diminished level of LDL-C receptor this causes increase in LDL-C and VLDL-C in diabetic patients.[8] Khursheed Muhammad Uttra, Bikha Ram Devrajani et al, stated that flux of free fatty acids back to the liver resulting enhanced secretion of VLDL-C from liver in to bloodstream.[5]

SUMMARY AND CONCLUSION

Thirty type 1 diabetic patients aged between 10 to 19 years were selected for the study. These patients were selected from KIMS hospital and private diabetic centers. Among 30 patients, females were 21(70%) and males were 9 (30%). Patients were on insulin treatment. They had not developed any complication. They were not obese and did not smoke.

Lipid profile including total cholesterol, triglycerides, high density lipoprotein-C, low density lipoprotein-C and very low density lipoprotein-C were measured in above said patients and were compared with age matched controls. The values of total cholesterol, triglycerides, high density lipoprotein-C, low density lipoprotein-C and very low density lipoprotein-C were high in type 1 diabetic patients when compared with controls. The values were statistically significant. The HDL-C values though found to be higher in type 1 diabetic patients, but were not statistically significant when compared with controls. Increase in total cholesterol and serum triglycerides found in type 1 diabetic patient could be due to excess use of lipid, due to faulty utilization of glucose by the cells. Excess free fatty acids are accumulated in the liver as serum triglycerides. Significant increase in the level of LDL-C and VLDL-C could be due to flux of free fatty acids back to the liver resulting enhanced secretion from liver to blood stream.

HDL-C levels are not much disturbed as observed by many authors. This could be due to relatively better controlled diabetic status of the patients by the insulin. Therefore it can be said that dyslipidemia is common among type 1 diabetic patient's age between 10 to 19 years, even though the glycemic status of the subject was within normal limits. If these patients are not treated with proper dose of insulin. Than dyslipidemia may lead to retinopathy, nephropathy, cardiovascular diseases etc.

Dyslipidemia remains largely undiagnosed and untreated in high risk population, such as patients with type 1 diabetes. So frequent and accurate lipid profile and glycated haemoglobulin assessment becomes necessary.

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