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A Comparative Study of Lipid Profile in Type I and Type II Diabetes.

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ABSTRACT

Background: Prevalence of D.M. has been steadily increasing in urban as well as rural areas in India & it will be one of the major cause of death in India in 21st century. Pattern of dyslipidemia is found to be different in Type I & Type II diabetes mellitus (DM). Aims and objectives: 1) Estimation of lipid profile in Type I and Type II DM. 2) Comparison of Lipid Profile in Type I and Type II DM. **Material and methods:** 50 patients of each already diagnosed Type I and Type II DM patients visiting OPD. 50 age and sex matched healthy controls. FPG (Fasting Plasma Glucose) and lipid profile were studied in the groups. Statistics: Students't' test was used. **Results:** FPG and TC, TG, LDL-C, VLDL-C were significantly high in both Type I and Type II DM compared to the controls. While HDL-C was significantly lower in diabetics compared to the controls. Among the diabetics all the parameters were significantly high in Type IIDM compared to Type I DM exceot HDL-C in which no significant difference was found. **Conclusion:** Glycaemic control is poorer in Type II DM compared to Type I DM. Also, dyslipidaemia is more prominent in Type II DM than in Type I DM.

Keywords: Diabetes Mellitus, Hyperglycemia, Lipid Profile.

INTRODUCTION

Diabetes mellitus is the most common endocrinal disease in the world today.[1] It is the major health problem affecting people all over the world. It is one of the most extensively investigated human diseases. The prevalence of disease has significantly increased worldwide and projected to increase in future. Amongst the various ethnic groups, Asian Indians seems to be at a particularly greater risk of developing diabetes.[1]

Diabetes mellitus is a syndrome characterized by chronic hyperglycemia and disturbances of carbohydrate, fat and protein metabolism associated with absolute or relative deficiencies in insulin secretion and or insulin action.

Dyslipidemia, one of the most common DM related co morbidities, refers to the increase of total cholesterol or/and triglycerides in the serum.[2] Patient with Type I DM are generally not heyperlipidemic if they are under good glycemic control. But patient with Type II DM are usually dyslipidmic even if under relative good glycemic control.[3] They have several lipid abnormalities including elevated plasma triglycerides, elevated Low Density Lipoprotein-Cholesterol (LDL-C) and decreased High Density Lipoprotein-Cholesterol (HDL-C). Insulin deficiency or insulin resistance diverts carbohydrate away from muscle glycogen storage into hepatic de novo lipogenesis, thus leading to the increase of plasma triglyceride concentration. The most common lipid abnormality noted in diabetics is hypertryglyceridemia.[2]

Moreover oxidation of the LDL particles result in its increased incorporation in the arterial wall via a receptor independent pathway resulting in high incidence of cardiovascular and cerebrovascular disease in DM individuals.[4] The plasma cholesterol level is a strong predictor of the risk of cardiovascular events in patients with diabetes.5[]

In our study lipid profile was done to find the patients at the risk for development of macrovascular complications.

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MATERIALS AND METHODS

A present study was conducted in Department of Biochemistry, Government medical college with the help of Medicine Department. The study was approved by Institutional Ethics Committee for research work. Type I and Type II DM patients visiting the medicine O.P.D. These cases were compared with apparently healthy controls. Diagnosed patients of Type I and Type II DM

having the disease for five or more years. Age and gender matched controls were selected. The patients and controls were divided in three groups as follows-

- Group I- Type I Diabetes mellitus. (50 cases)
- Group II- Type II Diabetes mellitus. (50 cases)
- Group III- Controls. (50 subjects)

Patients with liver diseases, HTN, smokers, alcoholics, pregnant and lactating women and patients with debilitating diseases like tuberculosis, cancers, AIDS etc were excluded from the study.

5ml of fasting venous blood sample was collected from the ante-cubital vein. Out of this 2ml was collected in F- bulb for estimation of fasting plasma glucose. Rest 3 ml was collected in plain bulb for estimation of lipid profile. The sample in the plain bulb was kept undisturbed for one and a half hour so that it clots. Then the clotted blood is subjected to centrifugation and the serum thus separated is used for investigations.

The Fasting plasma glucose was estimated by GOD-POD method. The Total Cholesterol was estimated by CHOD-PAP enzymatic method. Triglyceride, LDL-C (Low density lipoprotein Cholesterol) and HDL-C (High density lipoprotein Cholesterol) were estimated by direct enzymatic end-point methods. VLDL-C(Very low density lipoprotein Cholesterol) was estimated using Friedewald's equation.

One way Analysis of variance (ANOVA) has been used to find the significance of association of study parameters i.e. FPG and Lipid profile between three groups of patients i.e. Type I DM, Type II DM and controls. Post tu key test has been used to find the pair wise significance of study parameters. For comparison between two groups Students't' test was applied. For the study of co-rrelation Pearson's co-rrelation co-efficient was applied. The SPSS and Graph pad prism 5 software was used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc. Continuous data is presented as mean ±SD.

RESULTS & DISCUSSION

Table 1: Comparison of FPG and Lipid profile in Type I DM and controls

Sr.no	Investigation	Type I DM	Controls	p value
1	Fasting Plasma Glucose mg/dl	140.14 ± 53.33	80 ± 11.93	< 0.05
2	Serum Total Cholesterol mg/dl	238.34 ± 60.12	173.94 ± 9.62	< 0.05
3	Serum Triglyceride mg/dl	218 ± 59.80	122.8 ± 29.80	< 0.05
4	Serum HDL-C mg/dl	37.24 ± 5.66	48.04 ± 9.20	< 0.05
5	Serum LDL-C mg/dl	159.52 ± 59.10	94 ± 27.97	< 0.05
6	Serum VLDL-C mg/dl	43.6 ± 11.96	32 ± 6.23	< 0.05

The parameters in the [Table 1 & Figure 1] were compared between Type I diabetics and controls. It is found that the difference between the groups is significant with respect to all the parameters. All the parameters except HDL-C are significantly raised in the Type I diabetics as compared to the controls. HDL-C is significantly decreased in Type I diabetics compared to controls.

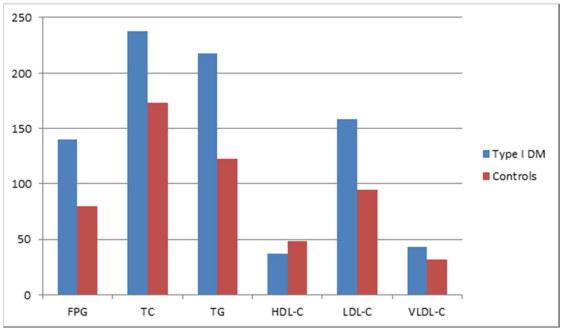

Figure 1: Bar Diagram showing comparison of FPG and Lipid profile in Type I DM and controls

The parameters in the [Table 2 & Figure 2] were compared between Type II diabetics and controls. It is found that the difference between the groups is significant with respect to all the parameters. All the parameters except HDL-C are significantly raised in the Type II diabetics as compared to the controls. HDL-C is significantly decreased in Type II diabetics compared to controls.

Table 2: Comparison of FPG and Lipid profile in Type II DM and controls

Sr.no	Investigation	Type II DM	Controls	p value
1	Fasting Plasma Glucose mg/dl	182.96 ± 59.49	80 ± 11.93	< 0.05
2	Serum Total Cholesterol mg/dl	278.52 ± 70.3	173.94 ± 9.62	< 0.05
3	Serum Triglyceride mg/dl	251.7 ± 42.24	122.8 ± 29.80	< 0.05
4	Serum HDL-C mg/dl	34.24 ± 5.07	48.04 ± 9.20	< 0.05
5	Serum LDL-C mg/dl	192.94 ± 68.7	94 ± 27.97	< 0.05
6	Serum VLDL-C mg/dl	50.5 ± 8.75	32 ± 6.23	< 0.05

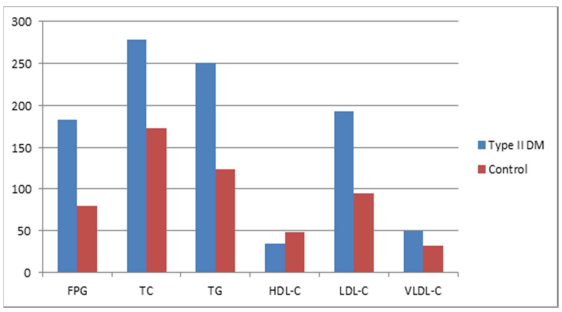

Figure 2: Bar diagram showing comparison of FPG and Lipid profile in Type II DM and controls.

The parameters in the [Table 3 & Figure 3] were compared between Type I DM and Type II DM patients. It is found that the difference between the groups is significant (< 0.05) with respect to FPG, Serum Total Cholesterol, Serum Triglyceride, LDL-C and VLDL-C. These parameters are significantly raised in the Type II diabetics as compared to the Type I diabetics. HDL-C was raised in Type II diabetics compared with Type I diabetics but the difference was not significant (> 0.05).

Table 3: Comparison of FPG and Lipid profile in Type I and Type II DM

Sr.no	Investigation	Type I DM	Type II DM	p value
1	FPG mg/dl	140.14 ± 53.33	182.96 ± 59.49	< 0.05
2	Serum Total Cholesterol mg/dl	238.34 ± 60.12	278.52 ± 70.3	< 0.05
3	Serum Triglyceride mg/dl	218 ± 59.80	251.7 ± 42.24	< 0.05
4	Serum HDL-C mg/dl	37.24 ± 5.66	34.24 ± 5.07	> 0.05
5	Serum LDL-C mg/dl	159.52 ± 59.10	192.94 ± 68.7	< 0.05
6	Serum VLDL-C mg/dl	43.6 ± 11.96	50.5 ± 8.75	< 0.05

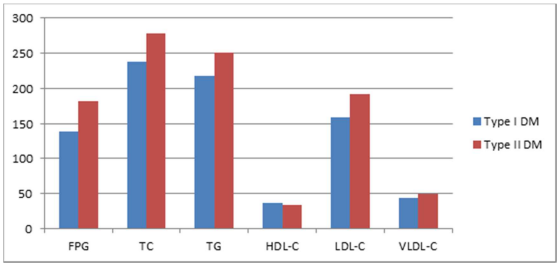

Figure 3: Bar diagram showing comparison of FPG and Lipid profile in Type I and Type II DM

Diabetes mellitus is the most common metabolic degenerating disease affecting mainly carbohydrate, lipid and protein metabolism. Diabetes mellitus is mainly due to insulin deficiency or insulin resistance. Insulin being an anabolic hormone its deficiency causes hyperglycemia due to increased gluconeogenesis and glycogenolysis and it affects lipid and protein metabolism by causing increased lipolysis which leads to ketosis and ketoacidosis and it affects overall protein biosynthesis which causes increased circulating amino acid pool.

Insulin plays a central role in regulating blood glucose. Deficiency of insulin or resistance to the action of insulin as seen in the diabetes mellitus is characterized by hyperglycemia. According to WHO criteria FPG ≥ 126 mg/dl on 2 occasions is diagnostic of diabetes mellitus.2 Random blood glucose ≥ 200 mg/dl on 2 occasions is also diagnostic of diabetes mellitus.[2]

In our study the mean FPG values of the Type I DM patients was 140.14 ± 53.33 mg/dl and of Type II DM patients was 182.96 ± 59.49 mg/dl. The mean FPG value of the controls was 80 ± 11.93 mg/dl. The values were significantly higher in the diabetics both Type I and Type II (p value <0.05) as compared to the controls. The mean FPG values were higher in Type II DM patients as compared to the Type I DM patients and the difference was statistically significant (p value <0.05).

Our findings coincided with Alejandra et al and Masram et al who found that the mean FPG levels were significantly higher in diabetics compared to the controls.[3,6] They also showed that Type II DM as compared to Type I DM had significantly higher mean FPG values.

The reason for increased blood glucose levels in Type I DM is progressive deterioration of beta cell function and ultimately they fail to produce insulin.[7] While in Type II DM insulin resistance is seen which increases with the duration of disease. Some Type II DM patients may have progressive beta cell failure also.[7]

The blood glucose levels in Type II DM are higher compared to Type I DM probably due to progressive deteriorating beta cell function and misguided attempts to avoid polypharamacy or insulin therapy.[8] The Type I DM patients are diagnosed early and the treated with insulin from the beginning therefore their blood glucose levels are better controlled.[8]

Hyperlipidemia and altered lipid metabolism are commonly seen in diabetes. The relationship between elevation of serum lipids and vascular rcomplication of diabetes has long been of interest because both tend to occur with greater frequency in diabetes mellitus than in general population. The increased risk of vascular disease in diabetic patients may be in part due to the associated hyperlipidemia.[9,10]

In our study we estimated the TC, TG, HDL-C, LDL-C and VLDL-C in controls, Type I and Type II DM. We found that the mean values of TC, TG, LDL-C and VLDL-C were significantly higher (p value <0.05) in diabetics both Type I and Type II DM as compared to controls. While HDL-C was significantly lower in diabetics compared to the controls (p value < 0.05). Among the diabetics the mean levels of TC,TG, LDL-C and VLDL-C were significantly higher in Type II DM patients as compared to Type I DM patients(p value <0.05). However the mean HDL-C levels showed no significant difference between Type I and Type II DM patients (p value >0.05).

Our findings correlated with Masram et al,[3] G et al,[11] Al Muhtaseb N et al and D M Joven J et al who showed similar comparative results in controls,[12,13] Type I and Type II DM.

Ladeia et al,[14] found a high prevalence of hypercholesterolemia in type -1 DM as compared to control and it correlated well with glycemic control.

Krishna Pushpa et al,[15] observed that hypertriglyceridemia was the most common lipid

abnormality in Type I diabetics as compared to control.

Hyperlipidemia is a relatively common problem in patients with poorly controlled diabetes mellitus. Diabetics as a group tends to have higher lipid levels than non-diabetics and this abnormality is exaggerated in patients with poor diabetic control.[9]

There are several reasons for this association as follows:

1) Insulin plays in important role in the regulation of intermediary lipid metabolism 16 and fluctuations in the degree of diabetic control thus produce variable effects on plasma lipoprotein metabolism like hypercholesterolemia and hypertriglyceridemia.[9,17]
2) Many non-insulin dependent diabetic patients are obese, and obesity may lead to the development of hyperlipidemia.[18]
3) Although diabetes and hyperlipidemia represent different genetic disorders, each of these disorders is common in the population and the two disorders may coexist by chance in the same individual.[18]
4) In diabetes there is increased mobilization of fatty acids from adipose tissue since insulin inhibits the hormone sensitive lipase.[19,20]
5) On the other hand, glucagon, catecholamines and other hormones enhance lipolysis.[21] This leads to secondary elevation of free fatty acid level in the blood.[22] They enter the liver and are esterified to form triglycerides.[23]
6) Diabetes is also known to be associated with an increase in the synthesis of cholesterol, which may be due to the increased activity of HMG CoA reductase.[24]
7) HDL cholesterol is low in untreated insulin-deficient diabetics which was associated with a decline in HDL turnover.[25]
8) Increased LDL-cholesterol may arise from glycosylation of the lysyl residues of apoprotein B as well as from decreasing affinity for the LDL receptor.[26]

CONCLUSION

Among the diabetics the Type II DM patients have poorer glycemic and metabolic control compared to the Type I DM therefore they are at higher risk of development of complications. This may be an indication of poor adherence to both dietary and medicinal therapy and can predispose patients to developing long-term complications of diabetes mellitus.

The diabetic patients had a higher prevalence of high serum cholesterol, high triacylglycerol, high LDL-C and high VLDL-C than the controls, indicating that diabetic patients were more prone to macrovascular diseases like cardiovascular diseases. All the diabetics should therefore be regularly screened for lipid profile along with routine measuring of the blood glucose level. This will help in preventing the development of complications and early detection of complications thereby decreasing the mortality and morbidity.

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