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Original Research Article

Comprehensive Analysis of Lipid Profile in Diabetic patients in Jamnagar, Gujarat

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Abstract

Objectives: Nearly 415 million world population is affected by diabetes mellitus (DM). Changes in lipid profile has been investigated to be associated with DM. Present study thus has conducted comprehensive analysis of lipid profile in DM.
Methods: 50 cases each of Type 1 DM, Type 2 DM & control were included in present study which was conducted at Guru Gobindsinh Hospital, Jamnagar, Gujarat by Physiology department, M. P. Shah medical college. Apart from FBS and urine sugar, lipid profile (i.e. S. Cholesterol, S. Triglyceride, S. HDL, S. VLDL, S. LDL) was done using enzymatic colorimetric tests. Prior consent was taken from patients.
Results: 72% cases in S. cholesterol, 74% cases in S. triglyceride, 72% cases in S. VLDL, 78% cases in S. LDL were found to be higher in Type 2 DM but with 30% of cases having low S. HDL level, it was inconclusive for association with Type 2 DM. However, majority of cases of Type 1 DM had all lipid profile levels within normal range.
Conclusion: Results were comparable for both Type 1 & 2 DM with Mrunalini *et al* and Carolyn *et al* studies except for mean S. VLDL which was higher in present study compare to Carolyn *et al* study. To conclude Lipid profile was on higher side for Type 2 DM (except S. HDL which was inconclusive) but normal for Type 1 DM in majority of cases. In females' lipid profile was on higher side for all cases included in comparison to males.
Keywords: Lipid Profile, Diabetes Mellitus, Type 1 & Type 2 DM.

1. Introduction

The prevalence of diabetes is on the rise, more alarmingly in the developing nations. The number of diabetic patients in the world has been estimated more than 415 million [1]. Diabetes mellitus is ranked 7th among leading causes of death [2] and has been rated 3rd when all its fatal complications are considered. Being pan metabolic disorder, diabetes is characterized by alteration in lipid profile, both quantitative and qualitative. In uncontrolled diabetes, serum triglyceride, very-low-density lipoprotein (VLDL), cholesterol is raised both at fasting & following fixed meal. In post mixed meal chylomicrons remnants & intermediate density lipoprotein remain high for longer period than normal. Total cholesterol & (low-density lipoproteins) LDL are mild to moderate high in 1/3 patients. On other end high-density lipoproteins (HDL) remain significantly low particularly in Type 2 diabetes patients with central obesity. Among changes in composition of Lipoproteins high proportion of small, dense triglyceride rich LDL & glycoxidation products of LDL are considered to be most atherogenic. So, lipid abnormalities should be aggressively detected and treated as a part of comprehensive diabetic care. This interesting facts about changes in lipid profile in diabetes mellitus has inspired to take this study.

2. Materials and Methods

The study was carried out at Physiology Department, M. P. Shah Government Medical College & Guru Gobindsingh Government Hospital, Jamnagar. Total 100 patients of DM were selected from diabetes clinic outdoor patient department, as well as indoor patients for this study. Fifty normal, healthy, volunteers between age group of 13 to 75 yrs. were selected for control study. They were of comparable age, sex and physical activity. They were non-smoker, not taking tobacco and free from any

other metabolic or organic disorder. Age, sex, duration of diabetes mellitus, family history of diabetes and detailed drug history was recorded. Exclusion criteria were: diabetic keto acidosis, diabetic nephropathy, hypothyroidism, obstructive liver diseases, acute hepatitis, SLE, Lymphoma, Multiple myeloma, pregnancy, pancreatitis, porphyria and renal diseases. Prior consent was taken from patients and information sheet regarding details of study was given and following lab investigations were performed: Urine sugar, FBS, Total cholesterol, Serum triglyceride, Serum HDL, Serum LDL, Serum VLDL and postprandial glucose test is a blood glucose test (PP2BS). Blood was collected using venepuncture before meal fasting blood glucose (FBS) and after 2 hours of meal (PP2BS). FBS sample was also used for lipid profiling. Enzymatic calorimetric method was used for lipid profile estimation. For blood sugar estimation enzymatic glucose oxidase peroxidase method was used.

3. Observations and Results

Lipid profiling in diabetes patients and control is done using serum cholesterol, serum triglyceride, serum HDL, serum VLDL and serum LDL. Lastly composite table showing gender wise distribution of lipids in control and diabetic persons is shown.

Table 1: Serum Cholesterol Level in Control, Type 1 and Type 2 DM

S. Cholesterol (mg %)	Control	Type 1 DM	Type 2 DM
150<	00	02	00
151-250	50	42	14
251-300	00	06	23
301-350	00	00	09
351-400	00	00	04
Total	**50**	**50**	**50**

The above table shows, majority of Type 2 DM subject (72%) showed high serum cholesterol level, while only (12%) Type 2 DM subject showed high serum cholesterol level. In control group, all persons had normal S. cholesterol level (151-250 mg %).

Table 2: Serum Triglyceride level in Control, Type 1 and Type 2 DM

S. Triglyceride (mg%)	Control	Type 1 DM	Type 2 DM
100-190	50	47	13
191-250	00	02	13
251-300	00	01	17
301-350	00	00	06
>351	00	00	01
Total	**50**	**50**	**50**

94% of Type 1 DM subjects showed normal (100-190 mg%) serum triglyceride level, while only 26% of Type 2 DM subjects showed normal level in comparison to control and high value of S. Triglyceride found in Type 2 DM while in Type 1 DM, it is not very high in comparison to control.

Table 3: Serum HDL level in Control, Type 1 and Type 2 DM

S. HDL (mg%)	Control	Type 1 DM	Type 2 DM
<34	00	00	15
35-60	48	48	35
>60	02	02	00
Total	**50**	**50**	**50**

In Type 1 DM subjects 96% of them showed normal (35-60 mg %) serum HDL value & 4% showed higher values. In contrast, Type 2 DM subjects showed higher values of HDL cholesterol in 70% while 30% showed lower serum HDL in comparison to normal control subject.

Table 4: Serum VLDL level in Control, Type 1 and Type 2 DM

S. VLDL (mg%)	Control	Type 1 DM	Type 2 DM
20-40	50	48	14
>40	00	02	36
Total	**50**	**50**	**50**

Serum VLDL levels were within normal limit in 96% of Type 1 DM subjects while 28% of Type 2 DM subjects were having normal level. Serum VLDL levels were higher in subjects with Type 2 DM (72%).

Table 5: Serum LDL level in Control, Type 1 and Type 2 DM

S. LDL (mg %)	Control	Type 1 DM	Type 2 DM
40-100	24	11	01
101-160	26	29	10
>160	00	10	39
Total	**50**	**50**	**50**

Serum LDL levels were high (>160 mg%) in 78% of Type 2 DM subjects while only 20% of Type 1 DM subjects were having higher values.

Table 6: Gender wise distribution of lipid profile in Type 1 and Type 2 DM

Gender	Mean S. Cholesterol (mg %)	Mean S. Triglyceride (mg %)	Mean S.HDL (mg %)	Mean S. VLDL (mg %)	Mean S. LDL (mg %)
Type 1 DM					
Female	205	139.07	52.11	26.81	126.99
Male	199.88	125.77	48.19	25.89	125.25
Type 2 DM					
Female	284	253.25	39.03	50	195.95
Male	277	246.17	30.88	49.50	189.03

In Type 1 DM subjects all the values of lipid profiles were within normal limit in both sexes. Female subjects were having slightly higher value of S. cholesterol, S. triglyceride, S. VLDL, S. LDL and S. HDL in contrast to male. In Type 2 DM subjects' lipid profile values were higher in both male and female. Similar to Type 1 DM, females were having higher values than male.

4. Discussion

In present study mean serum cholesterol in Type 1 DM was 201.98 mg% as compared to mean value of control 186.74 mg%. These results are closer to studies like Mrunalini *et al* (2000) [3] study with mean serum cholesterol in Type 1 DM was 214 mg% and Carolyn *et al* (1984) [4] with mean serum cholesterol in Type 1 DM was 204 mg% and that of control was 190 mg%. Gylling H *et al* (1997) [5] study observed lower absorption of cholesterol with significantly increased synthesis of cholesterol in NIDDM populations. In their study group lipid profile was inversely proportional to cholesterol synthesis and its metabolism.

In present study has mean serum Triglyceride for Type 1 DM at 131 mg% which is comparable to Carolyn *et al* (1984)[4] study at 118 mg% but higher in Jerrold M. *et al* (1974)[6] study at 239 mg%. While mean serum Triglyceride in Type 2 DM in present study is at 249.57 mg% which is comparable to Mrunalini *et al* (2000)[3] study at 209 mg% but quite low values in UK PDS (1997)[7] study at 69.8 mg%.

In present study mean serum HDL in Type 1 DM is at 49.78 mg% which is comparable to Mrunalini *et al* (2000)[3] study at 54 mg% and Carolyn *et al* (1984)[4] study at 50 mg%. While mean serum HDL in Type 2 DM in present study is at 38.02 mg% which is comparable to UK PDS (1997)[7] study at 39.1 mg% but higher in Vaverkov H *et al* (1997)[8] study at 46.6 mg%.

Mean serum VLDL in Type 1 DM of present study is at 26.27 mg% which is higher compare to Carolyn *et al* (1984) study at 20 mg%. While in Type 2 DM, mean serum VLDL in present study is at 49.78 mg% which is higher again compare to Carolyn *et al* (1984) study at 36 mg%.

In Type 1 DM of present study mean serum LDL is at 125 mg% which is comparable to Purnell JQ (1998)[9] study at 122 mg% but higher value is found in Carolyn *et al* (1984) study at 133 mg% and lower in Mrunalini *et al* (2000) at 117 mg%. While in Type 2 DM present study has mean serum LDL at 192.32 mg% which is lower in O'Neal DN *et al* (1998)[10] study at 159 mg% and quite low value is seen in Mrunalini *et al* (2000) study at 125 mg%.

In the present study it was found that S. Cholesterol, S. Triglyceride, S. LDL, S. VLDL and S. HDL were higher in female than male. These observations are well correlated with Carolyn *et al* (1984) study and UK PDS (1997) study for Type 1 and Type 2 DM respectively. The reason for this may be that the lipids in females may be affected by hormonal levels. Perez A *et al*[11] have observed less favourable lipid profile in diabetic women, which could explain absence of gender protection. The improvement in lipid profile may be observed by glycaemic optimization. On other hand T. Salamanderis *et al* (1998)[12] have reported no significant difference for gender wise lipid profile.

5. Conclusion

Serum cholesterol, in present study, is close to normal in Type 1 DM but higher (>250 mg%) in two third of cases of Type 2 DM. Thus, higher serum cholesterol is indicative of uncontrolled Type 2 DM. Serum triglyceride is also normal in majority of Type 1 DM but in half of cases of Type 2 DM it is more than 250 mg%. Hence, we can conclude that higher serum triglyceride is common in Type 2 DM rather than Type 1 DM. On the other hand, serum HDL was normal in almost all cases of control, Type 1 and Type 2 DM barring 15 cases of Type 2 DM having low HDL level. Thus, from present study we can deduce that low serum HDL level is not strong indication for Type 2 or 1 DM. Nearly two third of cases of Type 2 DM had high VLDL level indicating that there is strong association between high VLDL and Type 2 DM. But in Type 1 DM serum VLDL remains near normal. With nearly four fifth of cases of Type 2 DM having high serum LDL level, we can strongly say there is definite association between high serum LDL level and type 2 DM. But the same can't be said about Type 1 DM as only 10% of cases had high serum LDL level. In general female cases of Type 1 and Type 2 DM had slightly higher values in all lipid profile components including S. cholesterol, S. Triglyceride, S. VLDL, S. HDL and S. LDL. It may be associated with hormonal interaction with lipid metabolism resulting in higher values. But further research is needed to be conclusive of this evidence.

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