Comparison of Patterns of Lipid Profile in Type-2 Diabetics and Non-Diabetics

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Objective: To determine the commonest pattern of lipid profile in type 2 diabetics presenting in Mayo hospital and to compare it with non-diabetics. **Study design:** It was a comparative study. **Place:** It was conducted in all medical wards, medical OPD and patients seen in emergency. **Material and method:** Patients were selected according to inclusion criteria . After sampling for all relevant investigations, results were expressed after applying Chi-square test. **Results:** Serum cholesterol> 240mg/dl seen in 25% diabetics and 11% non-diabetics (p <0.05). Levels <240 and >200mg/dl seen in 35% diabetics and 19% non-diabetics (p <0.05).Serum cholesterol < 200mg/dl seen in 40% diabetics and 70% non-diabetics (p<0.05).LDL >160mg/dl seen in 21% diabetics and 5% non-diabetics (p<0.01).LDL < 130mg/dl seen in 32% diabetics and 42% non-diabetics (p >0.05).HDL < 35 mg/dl seen in 67% diabetics and 43% non-diabetics (p <0.05). HDL >35mg/ dl seen in 33% diabetics and 57% non-diabetics (p <0.05). TG >400 mg/dl seen in 8% diabetics and 3% non-diabetics.TG >200mg/dl seen in 38% diabetics and 93% non-diabetics (p<0.01).TG <200mg/dl seen in 62% diabetics and 3% non-diabetics (p<0.01). **Conclusion:** Diabetes and cardiovascular disease are closely associated . Diabetic dyslipidaemias are a major risk factor for athrosclerosis. The commonest dyslipidaemia found was low HDL cholesterol followed by high LDL ,serum cholesterol and TG levels.The commonest dylipidaemia found among non-diabetics in this study is high TG and low HDL,which might be associated with dietary factors and lack of exercise. Correction of dyslipidaemia is important to retard the progression of atherosclerosis.
Key words: TG, HDL-C, LDL-C, serum cholesterol, Type 2 diabetes.

Diabetic mellitus is a syndrome with disordered metabolism of glucose, resulting hyperglycaemia due to either deficiency of insulin secretion or combination of insulin resistance and inadequate insulin secretion[1].

Patients with type-2 diabetes have increased risk of cardiovascular disease associated with atherogenic dystipidaemia. Cardiovascular disease and its sequelae account for more than 80% of the morbidity and mortality in diabetic patients[2]. The incidence of CHD in the region of South Asia is as high as in European population[3]. Circulating lipoprotein levels are depended on insulin, as is plasma glucose. Once hyperglycaemia is corrected, lipoprotein levels generally become normal.

Type-2 diabetes associated with insulin resistance occurs as a metabolic syndrome (also known as syndrome-X) in obese patients. Hypertension, dyslipidaemia and procoagulant state off addition to hyperglycaemia are it's main features[4]. Hyperglycaemia and atherosclerosis are related in type-2 diabetes. Persistent hyperglycaemia causes glycosylation of all proteins especially collagen cross linking and matrix proteins of arterial wall. This eventually causes endothelial cell dysfunction, contributing further to atherosclerosis.

Combination of raised triglycerides and low HDL-C constitutes the commonest pattern of dyslipidaemia in type-2 diabetics. It's features are high triglycerides, low HDL-C and qualitative change in LDL patients producing smaller but dense LDL-C particles, whose membranes carry supranormal amount of free cholesterol. A low HDL-C is a major risk factor predisposing to macrovascular disease[5].

Increased oxidized LDL-C found in diabetics provides a rationale for antioxident therapy. High plasma levels of vitamin-E reduce risk of coronary heart disease. Dietary antioxidants are strongly recommended in diabetics[6].

Current American Diabetes Association guidelines accord reducing LDL-C, the first treatment priority, followed by increasing HDL-C and lowering triglyceriders[7]. Statins are the first line agents for lowering LDL-C. After 4-6 weeks of treatment, statins reduce LDL by 20-60%[8]. Normalisation of lipoprotein profile in diabetics has been demonstrated with good glycaemic control.

Table 1: Different ranges of plasma lipid levels *(Source: Washington Manual of Medical Therapeutics, 2001)*

Mg/dl	Desirable	Borderline	High risk
Total cholesterol	<200mg/dl	200-239mg/dl	>240mg/dl
TG	<200mg/dl	200-400mg/dl	>400mg/dl
LDL-C	<130mg/dl	130-159mg/dl	>160mg/dl
HDL-C	≥35mg/dl	<35mg/dl	<35mg/dl

Objective:

1. To determine the commonest pattern of lipid profile in type-2 diabetics presenting in Mayo Hospital, Lahore.
2. To compare the pattern of lipid profile in type-2 diabetics with non-diabetics.

Material and method

Setting: This study was conducted in all medical wards, medical OPD and diabetic clinic of Mayo Hospital on

patients admitted through outdoor or emergency department or seen in OPD, fulfilling inclusion criteria.

Study Design: It was a comparative study, in which the patterns of lipid profile in type-2 diabetics was compared with non-diabetics.

Sample Size: Two hundred patients were included in this study. Hundred patients with type-2 diabetes and hundred non-diabetic patients. Data was collected from patients fulfilling inclusion criteria. Brief history was taken and detailed physical examination was done. Blood sample for fasting and random blood sugar, fasting lipid profile and all relevant investigations were taken. Data was analysed by SPSS System and results were expressed after applying CHI-SQUARE test.

Inclusion Criteria

- Type-2 diabetics diagnosed on the basis of WHO criteria, previously not taking any lipid lowering therapy.
- Non-diabetics, previously not diagnosed as having lipid abnormalities, ...

Exclusion Criteria

- Type-I Diabetes mellitus.
- Patients with nephrotic syndrome.
- Patients with chronic liver disease.
- Patients taking beta-blockers or thiazide diuretics.
- Type-2 diabetics, taking lipid lowering medication.

Results

This study was conducted on 200 patients. Fasting lipid profile of 100 patients with type-2 diabetes and 100 non diabetics was checked. The male to female ratio was 49:51 in type-2 diabetics and 46:54 in non-diabetics. The mean age of type-2 diabetics was 51 years, and the mean age of non-diabetics was 48 years. It was found that the commonest dyslipidaemia among type-2 diabetics was raised serum triglyceride level, followed by raised LDL-C and serum cholesterol and low HDL-C.

Different ranges of plasma lipids as shown in Table 1, show desired levels of various plasma lipids in normal population without CHD or any risk factor for it. But in patients with CHD or those having one or more risk factors for it e.g., diabetes mellitus, the lipid levels should be lower than the reference limit for normal people.

Our results in graph 1 show that out of 100 patients with type-2 diabetes 38% had serum triglyceride above 200mg/dl and 62% patients had TG below 200mg/dl. Out of these 62% patients, 14% had TG less than 100mg/dl. Only 8% diabetics were found to have serum TG more than 400mg/dl. Whereas among 100 non-diabetics, 93% had TG <200mg/dl, 3% non diabetics were found to have serum TG >400mg/dl and all of them were females. No ...

Significant gender difference was found regarding serum triglyceride levels in type diabetics and non-diabetics.

Serum cholesterol level <200mg/dl was found in 40% type-2 diabetics and 70% non diabetics (graph 2) Serum cholesterol level >200mg but <240mg/dl was found in 35% patients with type-2 diabetes and 19% non diabetics. Serum cholesterol was significantly raised in type-2 diabetics as 25% diabetics had their serum cholesterol >240mg/dl as compared to 11% patients who were not diabetics.
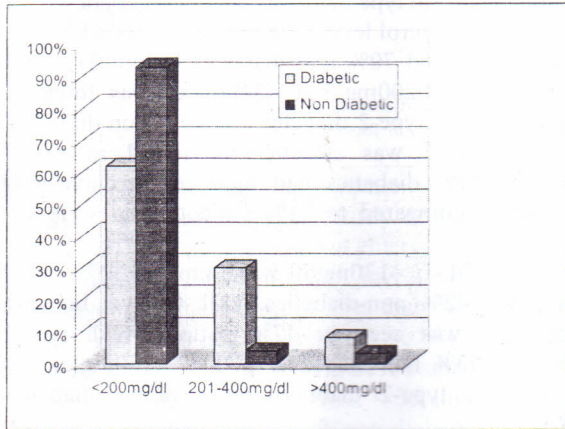
Serum LDL-C <130mg/dl was found in 32% type-2 diabetics and 42% non-diabetics. LDL-C level between 130-159mg/dl was seen in 47% patients with type-2 diabetes and 53% non diabetics. LDL-C >160mg/dl was found in 21% type-2 diabetics and 5% non-diabetics (graph 3).

Graph 4 shows HDL-C >35mg/dl in 33% patients with type-2 diabetics and 57% non-diabetics. HDL-C level <35mg/dl were found in 67% type-2 diabetics and 43% non-diabetics.
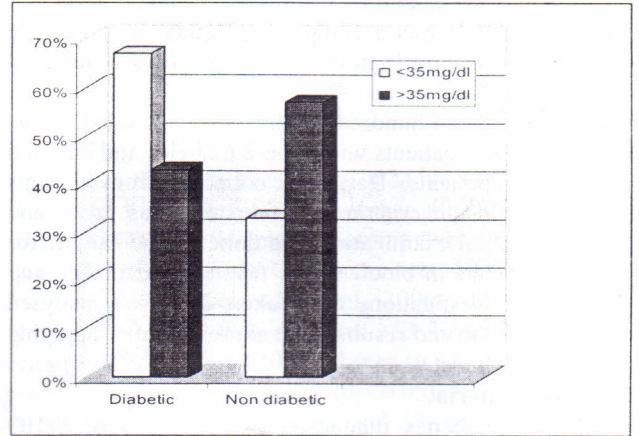
Comparing serum triglyceride level of type-2 diabetics and non-diabetics, higher values were found in type-2 diabetics (Graph 1). Serum TG <100mg/dl was seen in 14% diabetics as compared to 84% non-diabetics. It had a P-Vlue of <0.05 and was statistically significant. Serum TG>400mg/dl was found in 8% diabetics and 3% non-diabetics. It had a P-value of >0.05 and was not statistically significant. Serum cholesterol levels were also much higher in type-2 diabetics than non-diabetics (Graph 2). Serum cholesterol <200mg/dl was found in 40% diabetics and 70% non-diabetics. It had a P-value of <0.05 and had statistical significance. Serum cholesterol level between 201-240mg/dl was seen in 35% patients with type-2 diabetes and 19% non-diabetics. This had a P-value of <0.05 and was significant statistically. Serum cholesterol >240mg/dl was noticed in 25% diabetics and 11% non-diabetics. Its P-value was also <0.05 and was statistically significant.

Serum LDL-C level was also higher in diabetics than non-diabetics (Graph 3). LDL-C <130mg/dl was seen in 32% diabetics and 42% non-diabetics. Its P-value was >0.05 and was not significant. LDL-C level >160mg/dl was noticed in 21% type-2 diabetics and 5% non-diabetics. Its P-value is <0.01 and is very significant statistically when HDL-C levels of type-2 diabetics were compared with non-diabetics, much lower values were found in diabetics (Graph 4). HDL-C >35mg/dl was seen in 33% diabetics and 57% non-diabetics. Its P-value was <0.05 and was statistically significant. HDL-C <35mg/dl was seen in 67% diabetics and 43% non-diabetics. Its P-value was also <0.05 and was statistically significant, showing that most of the diabetics their HDL-C <35mg/dl.
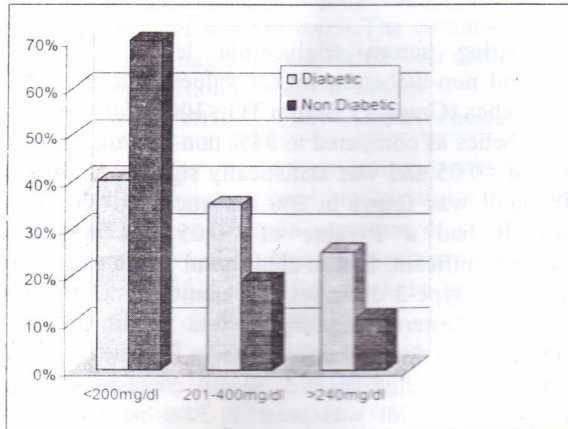
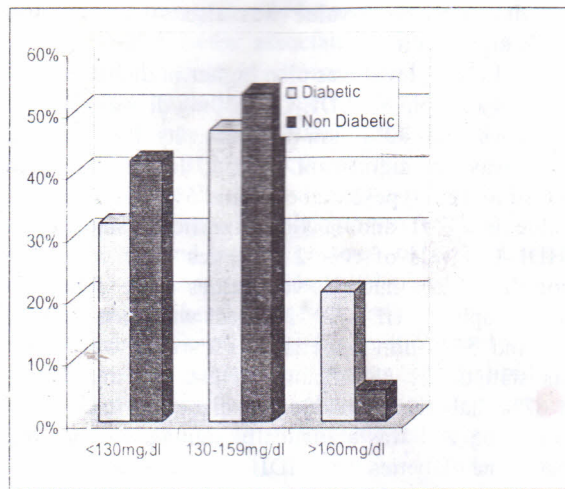Graph 1: Comparison of serum TG levels in Type 2 diabetics and non diabetics

Graph 2: Comparison of serum cholesterol levels in Type 2 diabetics and non diabetics

Graph 3: Comparison of LDL-C levels in Type 2 diabetics and non diabetics

Graph 4: Comparison of HDL-C levels in Type 2 diabetics and non diabetics

Discussion

Lipid abnormalities are common in diabetics and frequently seen in type-2 diabetics. Dyslipidaemias make diabetics prone to develop CHD and other complications of atherosclerosis.

In this study, fasting lipid profile of 200 patients was checked. Among 100 patients with type-2 diabetes, the commonest abnormality of lipoproteins was raised VLDL, as reflected by raised serum TG level. The serum TG >200mg/dl was found in 38% patients with type-2 diabetes among them 15% patients were male and 23% female diabetic patients. The prevalence of hypertriglyceridaemia varies with the level of glucose intolerance.

A study conducted in Nishtar Hospital, Multan by Ghulam Mustafa, Ahmad and Z.A.Raja et al showed that 21% patients with type-2 diabetes had raised serum cholesterol (>200mg/dl) and 34.2% patients have raised triglycerides in serum (>150mg/dl)[9]. Whereas, in our study serum cholesterol level >200mg/dl was found in 60% patients with type-2 diabetes and serum TG was raised in 38% diabetics. The values of serum TG in our study are consistent with above mentioned study. The reason for difference in serum cholesterol values may be due to difference in the dietary habits of the people at Multan and Lahore.

In our study, serum TG levels were found to be much raised among diabetic females as compared to males. Whereas serum cholesterol and LDL-C levels were higher among male diabetics, but no significant gender difference was found regarding HDL-C. Our results are partly consistent with a study by Walden CE et al, who reported that adverse effects of diabetes mellitus on dyslipidaemias are more marked in women than men[10].

M.A. Malik, Arif Nadeem and Nayyer Raza et al conducted a study on diabetic dyslipidaemias in Pakistani diabetics. It showed very high serum cholesterol (>300mg/dl) and triglyceride levels (<293.3mg/dl) in all patients[11]. When results of this study are compared with

our study, values are found to be quite low in our study. The reason may be difference of financial status and dietary habits of people.

In our study, 67% diabetics had HDL-C <35mg/dl. Low HDL-C was a common associated finding with raised serum TG, serum cholesterol and LDL-C. Framingham[12] and Bedford[13] studies also gave same findings. HDL-C may be the best predictor of CHD in type-2 diabetics followed by triglycerides and serum cholesterol. However, lowering LDL-C is more beneficial in lowering the risk of CHD in type-2 diabetes.

Hypertriglyceridaemia is the commonest lipid abnormality in type-2 diabetics, particularly those with poor glycaemic control. It is a potent risk factor for macrovascular disease due to reduced synthesis of insulin dependent lipoprotein lipase in the liver, resulting in impaired clearance of IDL, Chylomicrons and VLDL remnants. High TG levels are associated with hypercoagulability and decreased fibrinolysis, both contributing to CHD.

Khan et al studied the patterns of dyslipoproteinaemia in Karachi from 1989 to 1993. Hyperglyceridaemia was the most prevalent of all the lipid abnormalities[16].

Gulzar and Rehman et al conducted a study which revealed that 48% patients had hypercholesterolaemia[17], whereas in our study 25% patients have hypercholesterolaemia. The reason for this difference is increasing self awareness and literacy rate that had led to change in dietary habits of people.

Shoaib and co-workers conducted a study in Karachi which showed that patients with CHD had their HDL-C lower than of control[16]. A total of 60 subjects were included in it. HDL-C >35mg/dl was found in 44% patients with CHD as compared to 52% control. The result of this study matched with the findings of non-diabetics in our study, as 57% non-diabetics had their HDL-C >35mg/dl.

The main limitation of this study is that it is a hospital based study and cannot accurately reflect the lipid profile of whole population of Punjab. Another important fact is that it does not show the effect of glycaemic control on lipid levels.

Conclusion

1. Diabetics are prone to develop coronary atherosclerosis as compared to non-diabetics.
2. Diabetic dyslipidaemia is the commonest complication of type-2 diabetes and it predisposes them to premature atherosclerosis and macrovascular complications.
3. Common lipid abnormalities in type-2 diabetics are raised triglycerides, LDL-C serum cholesterol and low HDL-C.
4. Good glycaemic control can prevent development and progression of lipid-abnormalities among type-2 diabetics.

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