ORIGINAL ARTICLE

Changes in Serum Lipid levels in patients of Type 2 Diabetes Mellitus in Lahore Population

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ABSTRACT

Aim: To see serum cholesterol and triacylglycerol levels in type 2 diabetics in population of Lahore.
Design: Cross sectional analytical study.
Place and Duration of Study: The study was conducted at Post Graduate medical Institute, Lahore General Hospital and Sir Ganga Ram Hospital, Lahore.
Methods: A total of 160 type 2 diabetics (40 – 60 years of age both sexes) were included in the study. 24 healthy controls were matched for age and sex. Prior consent of all subjects was obtained. Well diagnosed cases of type 2 diabetes were included. Diabetics with hypertension or any other disease and pregnant women were excluded. Antecubital venous blood samples were taken in morning (0800-1000), after an overnight fast. Serum was obtained for lipid profile and blood glucose.
Results: There were total 84 males, 72 patients and 12 controls, and 100 females, 88 patients and 12 controls, enrolled in study. Male age ranges 45-60 years (mean 51.03±6.62) and female age ranges 40-60 years (mean 48.58±6.05). It was found out that there was a highly significant (P<0.001) increase in triacylglycerols and fasting blood glucose levels in male diabetics. In females there was a highly significant (P<0.001) increase in serum cholesterol, serum triacylglycerol and fasting blood glucose levels.
Conclusion: Present study shows that the diabetic patients are more susceptible to develop hyperlipidemia. The routine assay of the lipid profile should be done in patients of type 2 diabetes.
Keywords: Diabetes mellitus, Serum Cholesterol, Serum Triacylglycerol.

INTRODUCTION

Diabetes mellitus (DM) is a disease that consists of elevated blood glucose levels occurring from various interactions of heritable and ecological elements as a result of deficiencies in insulin secretion, insulin action, or both. Significant defects comprise chronic hyperglycemia, dyslipidemia and insulin resistance[1]. The defects in the metabolism of lipids, protein and carbohydrates present in diabetes are caused by inadequate action on target tissues by the insulin[2]. Diabetes mellitus type 2 is mainly due to the hereditary factors and the living style of the people[3].

Diabetes-associated changes in plasma lipid levels are one of the most important factors that are responsive to intervention[4]. The accurate mechanism of diabetic dyslipidemia is not recognized, however, a large body of support proposes that insulin resistance has a key role in the advancement of this condition[5]. Frequent specific features of diabetic dyslipidemia are the raised plasma triacylglycerols and triacylglycerol-rich very low density lipoprotein cholesterol (VLDL), decreased high density lipoprotein cholesterol (HDL), and an elevated number of small dense low density lipoprotein cholesterol particles (LDL)[6]. The central cause of the three prime features of diabetic dyslipidemia is the raised free fatty-acid discharge from insulin-resistant adipose cells[7]. Widespread endothelial impairment in diabetes can occur from different metabolic factors that comprise of elevated blood glucose, deranged lipid metabolism, increased blood pressure, high insulin levels, increased levels of fatty acids, high formation of reactive oxygen species, high levels of leptin and inflammation mediated by cytokines.[8] Persons having diabetes have more than a 200% greater risk of cardiovascular diseases than the non diabetic individuals[9].

Considering above facts we conducted a study to find the link between serum lipid profile and blood glucose as early finding and management of lipid abnormalities can curtail the possibility of atherogenic heart disorder and cerebrovascular accident in type-2 diabetics. Hence, the purpose of this study was to detect the diabetic dyslipidemia.

MATERIALS AND METHODS

This cross sectional analytical study was conducted at Post Graduate medical Institute, Lahore in collaboration with Lahore General Hospital and Sir Ganga Ram Hospital, Lahore from September 2013 to March 2014. A total of 160 type 2 diabetics and 24 healthy controls were included in the study. Well diagnosed cases of diabetes with age ranges from 40–60 years of both sexes were included. Diabetics with hypertension or any other disease and pregnant women were not included in the study. Formal consent was taken from each subject after the purpose and procedure of the study were clearly explained to them. A

questionnaire was made before the study started and it was filled from each subject before blood collection.

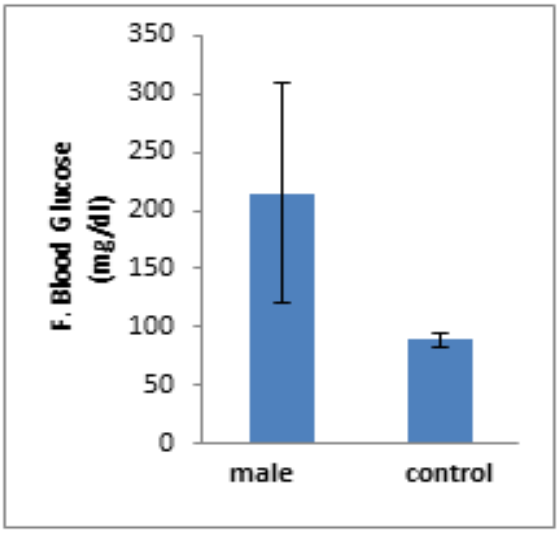
The volunteers avoided food and drink altogether for eight hours before the sample collection. The blood was obtained with the help of disposable syringes, by clean venipuncture, with minimal arm stasis. The whole blood samples were taken in the vaccutainer tubes containing no anticoagulant. The tubes were incubated in an upright position at room temperature for 30-45 min to allow clotting. The tubes were centrifuged for 15 min at 1000-2000 RCF and then the supernatant (serum) was separated at room temperature. The serum separated was stored. Quantitative analysis of serum cholesterol, triacylglycerol and blood glucose was carried out.

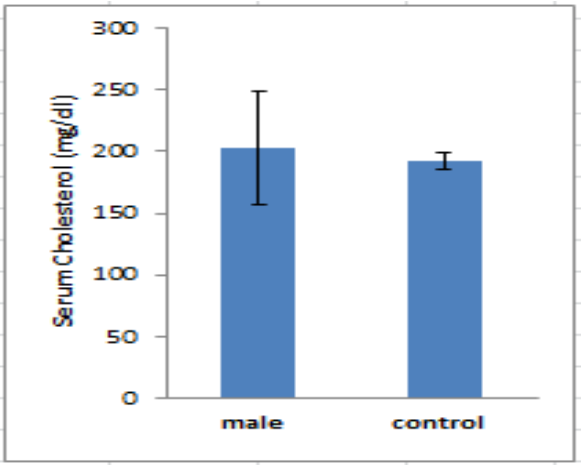
The data was analyzed using SPSS 17. Variables were presented in tabulated form. Mean ± SD (standard deviation) was given for quantitative variables. Student 't' test was used to compare the levels of different variables with those for normal subjects. P-value of < 0.05 was considered statistically significant.

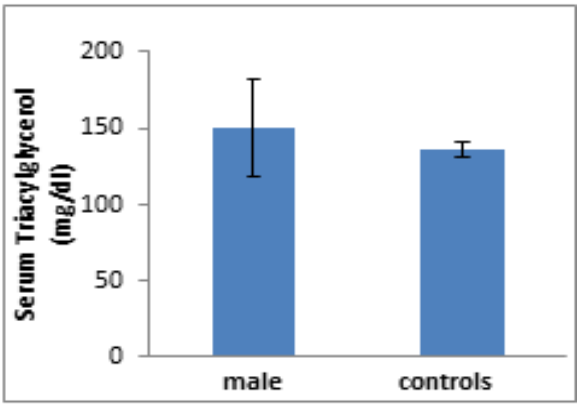
RESULTS

There were total 160 patients and 24 controls enrolled in the study and among them there were 84(45.6%) males and 100 (54.34%) females. Male age ranges 45-60 years (mean 51.03±6.62) and female age ranges 40-60 years (mean 48.58±6.05). Serum cholesterol, triacylglycerol and glucose levels in diabetic male patients and their controls were tabulated (Table 1). Mean levels of serum cholesterol, triacylglycerol and blood glucose fasting were higher in patients (serum cholesterol=202.6±46.1mg/dl, serum triacylglycerol=150.67±32.18 mg/dl and blood glucose fasting=214.58±94.05 mg/dl) as compared to their controls. Highly significant difference (P<0.001) was observed in case of serum triacylglycerols and fasting blood glucose (Figure 1).

Fig. 1: Serum gholestero, triacylglycerol and glucose levels in male patients and controls

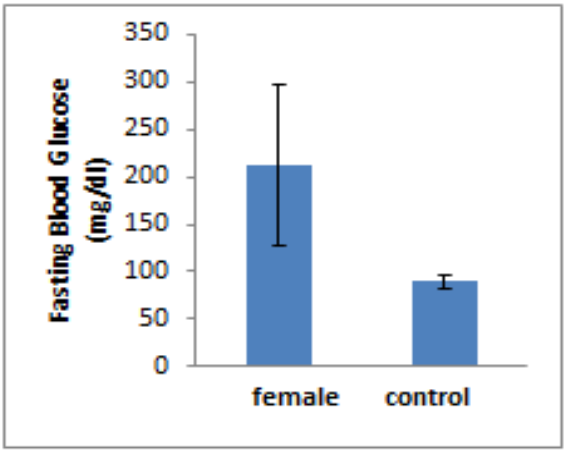


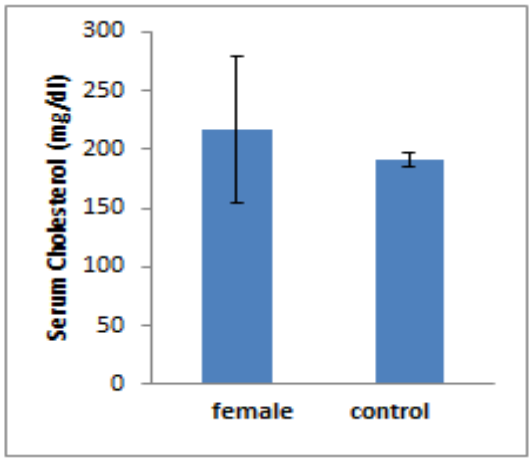




Serum cholesterol, triacylglycerol and glucose levels in diabetic female patients and their controls were tabulated (Table 2). . Mean levels of serum cholesterol, triacylglycerol and blood glucose fasting were higher in patients (serum cholesterol = 216.75±61.79 mg/dl, serum triacylglycerols = 150.28±33.73 mg/dl and blood glucose fasting = 212.06±84.05 mg/dl) as compared to their controls and highly significant difference (P<0.001) was observed in case of serum cholesterol, serum triacylglycerol and fasting blood glucose (Figure 2).

Fig.2: Serum cholesterol, triaclyglycerol and glucose levels in female patients and controls





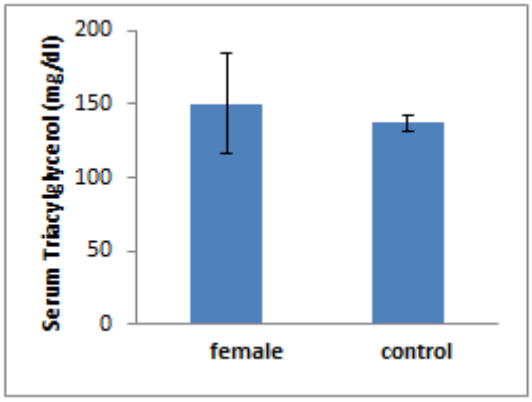


Table 2: Serum cholesterol, triaclyglycerol and glucose levels in male patients and controls

Parameters	Male	Control	T test	P value
Age (years	51..03±6.62	48.67±4.79	1.49	0.141
Serum cholesterol(mg/dl)	202.6±46.1	191.92±7.0	1.84	0.0694
Serum triacylglycerol (mg/dl)	150.67±32.18	136.33±4.81	3.55	0.0006***
Fasting blood glucose (mg/dl)	214.58±94.05	89.08±6.39	11.17	<0.0001***

***P<0.001=highly significant difference

Table 2: Serum cholesterol, triaclyglycerol and glucose levels in female patients and controls

Parameters	Female	Control	T test	P value
Age (years	48.58±6.06	49.92±6.47	0.68	0.4981
Serum cholesterol(mg/dl)	216.75±61.79	191.17±6.63	3.73	0.0003***
Serum triacylglycerol (mg/dl)	150.28±33.73	137±5.07	3.40	0.0010***
Fasting blood glucose (mg/dl)	212.06±84.05	89.33±6.14	13.38	<0.0001***

***P<0.001=highly significant difference

DISCUSSION

It is predicted that 30-60% of patients with Type 2 diabetes have dyslipidemia[10]. Defects in serum triacyglycerol and cholesterol levels is very usual and commonly present in patients of diabetes type 2. Derangements in the serum lipid profile predisposes the diabetics to coronary heart disease and other complications of atherosclerosis[11]. Cardiac disease is the key cause of ill health and death in both males and females with diabetes (almost 50-70% of deaths)[12]. The relationship of dyslipidemia and diabetes type 2 has been an increasing concern for the medical community as the co-occurrence of cardiovascular problems ultimately leads to high rate of death[13].

The development of dyslipidemia in diabetics is very complex. Insulin stops the breakdown of fats in the adipose tissue. Normally insulin inhibits the enzyme hormone sensitive lipase that is present in the cytoplasm of fat cells, specially visceral fat cells. Due to lack of insulin in diabetics the inhibition of hormone sensitive lipase activity is released that causes increase in the breakdown of triacyglycerols in the fat cells, therefore releasing free fatty acids in portal circulation. These free fatty acids are taken up by the liver, packed and secreted as very-low-density lipoprotein from the liver, causing an increase in circulating triacylglycerol level[14].

The 2019 American Diabetes Association (ADA) mentions that mature patients with diabetes have their lipid profile investigated at the time of diabetes diagnosis and as a minimum every 5 years afterwards or more often if specified[15]. In managing dyslipidemia in diabetics, there should be a detailed evaluation so as to find the other causes that can be a contributing factor to the abnormal serum lipid levels[4]. Early treatment of lipid disorders should emphasis on lifestyle modifications[16]. Lifestyle modifications like dietary changes and increased physical activity are the foundations of management. For the diabetics with poor glycaemic control, the main point of interest should be to attain near normal blood glucose levels, anticipating that this will also improve dyslipidemia[17,18,19].

Present study showed significantly higher levels of fasting blood glucose in both male and female diabetic patients. This was in accordance to the studies in which fasting glucose levels were significantly high in diabetic men and women.[1,20] The blood sugar level rises in diabetic patients because of deficiencies in insulin secretion, insulin action or both[1].

Present study reported significant difference in the levels of serum total cholesterol and triacylglycerol in diabetic patients. This was in agreement with the studies that showed higher values of total cholesterol and triacylglycerols in diabetic patients.[21,22] This abnormally increased level of serum lipids in diabetics is mainly due to increased mobilization of free fatty acids from peripheral fat depots.[23]

CONCLUSION

It has been concluded from the study that diabetic patients are at an increased risk of dyslipidemia. Results suggest a high incidence of dyslipidemia, which might be an important contributing factor in the development of cardiovascular events among diabetic patients. Early finding and management of lipid abnormalities can curtail the possibility of atherogenic heart disorder and cerebrovascular accident in type-2 diabetics. The routine assay of the lipid profile should be done in patients of type 2 diabetes.

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