DOI: https://doi.org/10.53350/pjmhs22169598

ORIGINAL ARTICLE

Comparison of Lipid Profile in Insulin Dependent Diabetic Patients and Control Groups

YASMEEN AKHTAR[1], TABINDA IJAZ[2], FAYYAZ AHMAD[3], MUHAMMAD ATIF[4]
[1]*Department of Biochemistry, Gulab Devi hospital, Lahore, Pakistan*
[2]*Faculty of Allied Health Sciences, University of Lahore, Lahore, Pakistan*
[3]*PESSI, MNCH, KLP, Lahore, Pakistan*
[4]*Department of Clinical Laboratory Sciences, College of Applied Medical Sciences, Jouf University, Sakaka 72388, Saudi Arabia*
Correspondence to: Muhammad Atif, Email: aatif03@gmail.com, Cell: +966 55 7626811

ABSTRACT

Background: Insulin dependent diabetes mellitus is a worldwide health problem. In diabetic patients' high levels of cholesterol leads to atherosclerosis and coronary heart diseases.

Aim and Objective: Our objective was to investigate the comparison of dyslipidemia in insulin dependent diabetic patients and control group.

Methods: A cross sectional study was done on 48 people in which 24 were insulin dependent diabetic patients and 24 were normal people, sample were taken from Gulab Devi hospital, Lahore. Blood samples were collected from both the patients and the control group after an overnight fasting for lipid profile and serum was separated from the whole blood by centrifugation. Samples were analyzed and the data was entered and analyzed by using SPSS version 20.

Results: In this study increased triglycerides levels 21(87.5%), cholesterol levels 10(41.66%), LDL levels 8(33%), VLDL 21(87.5%) levels and decreased HDL levels 6(25%) were found in insulin dependent diabetic patients.

Conclusion: We concluded that the levels of Cholesterol, Triglyceride, LDL and VLDL were increased in insulin dependent diabetic patients while HDL levels were low.

Keywords: Lipid profile, Insulin dependent diabetes.

INTRODUCTION

Diabetes mellitus is a form of metabolic disorder characterized by the increase blood glucose levels emerging from decrease in insulin excretion, insulin activity or both[1]. Insulin is a hormone secreted by the islet cells of the pancreas, and it is compulsory to make use of glucose from digested food as a source of energy. Severe hyperglycemia is related with micro and macro vascular complications that can lead to visual artefacts, blindness, kidney disease, neuropathy, coronary heart disease and stroke. Data from WHO published in 2011 stated a total prevalence of diabetes to 12.9 million, out of which only 9.4 million people were diagnosed while 3.5 million remain undiagnosed. It also highlighted that about 20.5% female and 15.9% men around the globe are suffering from diabetes[2].

Type 1 diabetes is immune-mediated diabetes in which impairment of beta cells results in diminished insulin secretion, and the prevalence of this type of diabetes is 5-10% of total diabetic patients and it is continuously increasing globally with both short term and long-term complications. This disease is genetically determined and often inherited via the HLA system, but the contributory factors that trigger the onset of this disease are mostly unknown[3].

Cholesterol is a vital lipid that can be synthesized by the body and can be ingested from animal derived food. It serves many important functions in the body but higher levels of it can be highly dangerous for the human body. Cholesterol levels in the body can be maintained by good lifestyle choices, diet and exercise. Diabetes mellitus enhances cholesterol absorption effectivity and increases insulin resistance[4]. The free fatty acids can be burned by nearly all the tissues of the body except the brain. They are burned in the mitochondria via oxidation to Acetyl CO-A, which can enter the citrate acid cycle for conversion to CO2, ATP and water. When excessive portions of glucose are absorbed, they can be transformed to a storage form triglycerides[5]. Type 1 diabetes mellitus, where serum insulin level is low, is associated with altered lipoprotein metabolism [6].

Dyslipidemia is regarded as a risk factor for coronary heart disease which is also a risk factor in type 1 diabetes. Patients with type 1 diabetes exhibit lipid impairment that frequently cause irregularity of lipoprotein, which may additionally cause atherosclerosis. Pathophysiology of these lipid abnormalities has not been completely explained; however high glucose level and peripheral hyperinsulinemia, due to the subcutaneous passage of insulin are thought to play a role[7]. Adults with type 1 diabetes are recognized to have a higher threat for atherosclerotic compared with the normal people[8].

Previous studies have reported that the poor diabetic control based on amount HbA1c, or fasting blood glucose are linked to increase cholesterol ($P<0.01$), triglyceride ($P<0.007$) and lipoprotein sub fraction except for high density lipoprotein cholesterol. On the other hand, people with controlled diabetes had lipid levels comparable to non-diabetic group[9]. The metabolism of cholesterol is less studied in patients with type1 and type 2 diabetes in but the previous studies have reported a higher absorption of cholesterol in type1 than in type 2 diabetes[10]. It is thought that good diabetic control will result in a lower serum level of lipids. But the clear mechanism that how it affects the lipoprotein levels is not clear[11]. The rational of this study was to compare lipid levels in insulin dependent diabetic patients and compare with healthier peoples. This will reduce many risk factors by controlling the level of sugar and prevent many diseases, especially heart disease.

MATERIAL AND METHODS

Study design: This cross-sectional study was conducted in the Department of Biochemistry, Gulab Devi hospital Lahore, Pakistan. Target population was insulin dependent diabetic patients and healthy peoples were used as control. This study was completed in 3 months starting from November 2018 to January 2019. A total of 48 insulin dependent diabetic individual was included in this study. Blood sample was taken from these patients after overnight fasting for lipid profile and serum was separated from the whole blood by centrifugation. Lipid profiles were measured in both insulin dependent diabetic patients and control group.

Estimation of Cholesterol: Cholesterol was analyzed by esterase hydrolyzed cholesterol ester method. In this assay, cholesterol reacted with oxygen into cholest-4-en-3-on and H_2O_2 by bacterial cholesterol oxidase. H_2O_2 further formed a complex with phenol and amino-4-antipyrine and produced a pink color, absorbance of which at 500-550 nm was equal to cholesterol concentration in blood. (Merck, Pakistan)

Estimation of triglyceride: Triglyceride was measured by GPO-PAP (Glycerol phosphate oxidase-paraminophenazone) method. Triglyceride found in the serum sample was breakdown to phosphatide and was then oxidized to dihydroxyacetone phosphate by glycerol phosphate oxidase. The released H_2O_2 was

measured by a chromogenic dye, chlorophenol-4-aminoantipyrine, with the help of peroxidase. The red color complex formed was proportional to the triglycerides present in the sample and were analyzed at 546 nm. (Merck, Pakistan).

Estimation of HDL-cholesterol: It was determined by using phosphotungstic acid precipitation technique. Chylomicrons, VLDL and LDL in serum were isolated from HDL by precipitating with H3PW12O40 and $MgCl_2$ with centrifugation. The cholesterol in the HDL which remained in the supernatant was determine with by cholesterol oxidase method. (Merck, Pakistan).

Calculation of LDL-C and VLDL-C: The LDL-cholesterol was calculated by Friedewald equation.

LDL-C=CHOL-HDL-TG/5

VLDL-C=TG/5

Data Analysis: The data was analyzed by using the SPSS 20. p value of <0.05 was considered as statistically significant.

RESULTS

In this study out of 48 people, 24(50%) were with insulin dependent diabetic patients and 24(50%) were included in the control group. There were (56.25%) male and (43.75%) female and 27 patients (56.25%) have no family history of diabetes and 21 patients (43.75%) have family history of diabetes. In this study (60.24%) belong to poor families and (39.51%) belong to middle class families.

This study report higher triglyceride and cholesterol values in diabetic patients as compared to control subjects as show in table 1 and 2. We also found 6 diabetic patients to have lower HDL level and 8 have higher LDL levels as shown in table 3 & 4. The values of VLDL were in 21 diabetic patients as shown in table 5.

Table 1: Comparison of Triglyceride in diabetic and control group

Triglyceride	Values	Diabetic group	Control group	Total
TG Normal	50 -150	3	17	20
TG Abnormal	>150	21	7	28
Total		24	24	48

Table 2: Comparison of cholesterol in Diabetic and control group

Cholesterol	Values mg/dl	Diabetic group	Control group	Total
CHO Normal	140-200	14	21	35
CHO Abnormal	>200	10	3	13
Total		24	24	48

Table 3: Comparison of HDL in Diabetic and control group

HDL	Values mg/dl	Diabetic group	Control group	Total
HDL Normal	30-75	18	24	42
HDL Abnormal	<30	6	0	6
Total		24	24	48

Table 4: Comparison of LDL in Diabetic and control group

LDL	Values mg/dl	Diabetic group	Control group	Total
LDL Normal	50-130	16	23	39
LDL Abnormal	>130	8	1	9
Total		24	24	48

Table 5: Comparison of VLDL in diabetic and control group

VLDL	Values mg/dl	Diabetic group	Control group	Total
VLDL Normal	10-35	3	21	24
VLDL Abnormal	>35	21	3	24
Total		24	24	48

Correlation of diabetes with lipid profile: We calculate the correlation between diabetic patients and all parameters of lipids profile. All tests (TG, Cholesterol, HDL, LDL and VLDL) showed significant relation between diabetes and lipid profile P value= ≤0.005 as shown in table 6.

Table 6: Correlation of diabetes with lipids

Parameters	Diabetic and Control group (N=24)	Mean±SD	P=value
Triglyceride (mg/dl)	Diabetic	252.67±128.21	0.004
	Control	154.25±25.49	
Cholesterol (mg/dl)	Diabetic	206.25±66.18	0.003
	Control	175.83±23.82	
High density lipoprotein (mg/dl)	Diabetic	37.00±18.22	0.000
	Control	61.42±5.28	
Low density lipoprotein (mg/dl)	Diabetic	111.83±47.11	0.002
	Control	103.33±22.5	
Very low-density lipoprotein (mg/dl)	Diabetic	53.04±23.10	0.004
	Control	31.00±5.36	

DISCUSSION

Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. In type 1 diabetes the beta cells fail to produce insulin due to different reasons. In insulin dependent diabetes mellitus, lipid metabolism is disturbed which leads to Dyslipidemia. We compare the lipid profile in insulin dependent diabetic patients with healthy control subject and compare the results of Dyslipidemia in both groups.

In this study we found dyslipidemia in type 1 diabetes mellitus with higher levels of cholesterol, TG, LDL and VLDL being statistically significant in patients group as compared to control group. HDL levels were significantly low in diabetic patients as compared to the control group. Our results are in agreement with a similar study which also reported dyslipidemia in type 1 diabetes patients[12].

A similar study had found a higher percentage of TG and VLDL levels in diabetic patients than in controls (p=0.001) group, but they found no statistical difference in TC, HDL and LDL in T1DM patients as compared to control group[13]. Another study conducted on children and adolescents found dyslipidemia in type 1 diabetes (65%) patients as compared to that of control group (28.2%). They found an increased level of TG and VLDL in type 1DM as compare to the control group[14].

The results of this study show that dyslipidemia is an additional risk factor for diabetes patients which may result from altered lipid metabolism in these patients. Dyslipidemia can further complicate the current disease and can further lead to serious complications linked with diabetes mellitus. So, it is quite important for diabetic patients so have a good lifestyle, diet and exercise to control the lipid levels in order to avoid the serious outcomes of diabetes mellitus.

CONCLUSION

This study concludes that dyslipidemia was increased in insulin dependent diabetic patients as compared to the control group. Controlling diabetes can prevent dyslipidemia which can further control the many risk factors of heart diseases, especially coronary heart disease in type 1 diabetic patients.

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