# ORIGINAL ARTICLE
# PATTERN OF DYSLIPIDEMIA IN ADULT DIABETIC SUBJECTS IN THE COMMUNITY HOSPITAL OF DISTRICT SWAT

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**Background:** The incidence of diabetes is growing at dramatic rates around the word and its complications are associated with significant health and financial burdens, warranting strong and comprehensive prevention efforts. The objective of the present study was to evaluate the pattern of dyslipidemia in the adult diabetic patients in Saidu Teaching Hospital, Saidu Sharif, Swat. **Methods:** The study comprised of 100 subjects, 50 subjects with diabetes and 50 (non-diabetic) controls. The serum Cholesterol, Triglycerides, High-density Lipoprotein-Cholesterol (HDL-C) and Low-density Lipoprotein-Cholesterol (LDL-C), blood sugar (random and fasting), blood pressure (systolic and diastolic) of Diabetic subjects were compared with Control subjects. **Results:** Diabetic subjects had high mean value of Triglycerides and LDL-C (but statistically non-significant), low level of HDL-C (statistically highly significant) and high blood pressure as compared to Control subjects. **Conclusion:** Dyslipidemia is a potent predictor of cardiovascular morbidity and mortality in diabetic patients.
**Keywords:** Diabetes mellitus, Dyslipidemia, Blood pressure

## INTRODUCTION

Diabetes mellitus is defined as a metabolic syndrome or disorder of multiple aetiologies characterised by chronic hyperglycaemia associated with impaired carbohydrate, fat, and protein metabolism. These abnormalities are the consequences of either inadequate insulin secretion or impaired insulin action or both.[1] The main types of diabetes are type-1 and type-2 diabetes and pancreatic B-cells deficiency or function deficiency leads to both type-1 and type-2 diabetes. Restoration or replacement of B-cells function is therefore the logical long-term solution to therapy of diabetes. Type-1 diabetes results from an irreversible loss of pancreatic B-cells and type-2 diabetes is primarily caused by impaired insulin action, but the risk of developing of type-2 diabetes rises exponentially with increasing obesity and insulin resistance and therefore temporary restriction of glucose control in patients with type-2 diabetes is often achieved through weight loss and increased physical activity.[2] The incidence of diabetes is growing at dramatic rates around the world[3] and the prevalence and incidence of type-2 diabetes varies among ethnic groups, such as higher rates in Asians than in western population even under the condition of similar body mass index.[4] It is estimated recently that 220 million people word wide will be affected by type-2 diabetes by 2010 and in the US, type-2 diabetes accounts for approximately 95% of the cases of diabetes, resulting in an annual economic toll of approximately 100 billion dollars[5] and if untreated diabetes can lead to serious problems like macrovascular and microvascular complications. The microvascular complications include retinopathy, nephropathy, and neuropathy (both distal polyneuropathy and autonomic neuropathy)[6], while the macrovascular complications of diabetes include angina, myocardial infarction (MI), transient ischemic attack (TIA), and stroke.[7] The pattern of dyslipidemia frequently observed in people with diabetes includes raised triglycerides, decreased HDL-C and slightly raised or normal plasma concentrations of LDL-C, with LDL-C, not being significantly different from that in non-diabetic individuals.[8,9] As a result some have argued that to reduce the risk of future cardiovascular events in people with diabetes it may be more important to modify HDL-C and triglycerides level than to lower total cholesterol or LDL-C levels.[10] In another study the hallmark of dyslipidemia in patients with type-2 diabetes and increased risk of cardiovascular disease and accelerated atherosclerosis are hypertriglyceridemia, decreased HDL-C and increased LDL-C levels. So lipid management is so critical in the diabetic patients, that physician of diabetic patients should not ask themselves, why they should institute lipid lowering therapy but why not institute lipid lowering therapy. Normal lipid levels for diabetics patients are LDL-C less than 100 mg/dl, HDL-C greater than 45 mg/dl in males and 55 mg /dl in females, triglycerides less than 150 mg/dl, serum cholesterol less than 200 mg/dl[10], and non-HDL-C less than 130 mg/dl.[11]

Dyslipidemia increases the risk of cardiovascular disease, heart attack and stroke and according to US Centre for Disease Control and Prevention it affects 70% to 97% of people with diabetes. If one has diabetes, lowering ones high triglycerides or cholesterol level is just as important as controlling blood sugar and blood pressure that is because people with diabetes are at high risk for

dyslipidemia.[12] Accelerated atherosclerotic vascular disease demonstrated by the patients with diabetes is a result of the metabolic cascade, including insulin resistance, hypertriglyceridemia, hypertension, endothelial dysfunction, and subsequent increase in triglycerides, LDL, and very low-density lipoprotein (VLDL) synthesis and decrease in HDL.[13] However there is overwhelming evidence, that an elevated LDL-C concentration in plasma is atherogenic, whereas a high HDL-C level is cardioprotective.[14] Atherosclerosis is an insidious and dangerous disease and the hallmark feature of atherosclerosis is the building of cholesterol in to lesions called plaques that can reduce the flow of blood. When the delivery of blood to the heart muscle drops enough, this can result in the development of chest pain or angina. Angina indicates that the heart muscle is not receiving enough oxygen to carry out its pumping functions. Atherosclerotic plaques can also suddenly rupture, develop a blood clot on their surface, and completely choke off a portion of heart muscle. This chain of events frequently results in heart attack or sudden death without warning. Atherosclerotic disease also predisposes people to stroke, peripheral vascular disease, lower extremity amputation, and loss of kidney function, among other devastating outcomes. The most important risk factors for atherosclerosis are elevated blood pressure, diabetes mellitus, obesity, inactivity, smoking and lipid profile which comprise low-density lipoprotein cholesterol, triglycerides, and high-density lipoprotein cholesterol. High-density lipoprotein cholesterol (HDL-C) is beneficial for a number of reasons. The most important is its ability to drive a process called 'reverse cholesterol transport'.[15]

Since controversies exist in different studies on the issue with ethnic groups, the present study was designed to evaluate the pattern of dyslipidemia in adult diabetics in district Swat.

## SUBJECTS AND METHODS

It was a cross-sectional study carried out in the Department of Physiology, Saidu Medical College, in collaboration with the Department of Medicine, Saidu Teaching Hospital, Saidu Sharif, Swat. The study comprised of 100 subjects, 50 subjects with diabetes and 50 control (non-diabetic).

The serum Cholesterol, Triglycerides, High-Density Lipoprotein-Cholesterol (HDL-C) and Low-Density Lipoprotein-Cholesterol (LDL-C), blood sugar (random and fasting) in diabetic and non-diabetic subjects were determined by standard kit methods and compared with controls. Blood pressure (systolic and diastolic) was also measured using mercury column sphygmomanometer and the values in diabetics were compared with non-diabetics.

The data were analysed using SPSS-15 and $p<0.05$ was taken as significant.

## RESULTS

Fasting blood sugar level of diabetic was 218.7±75.5 mg/dl and that of control was 96.2±13.1 mg/dl. Similarly random blood sugar level of diabetic was 299.3±81.6 mg/dl and that of control was 140.0±19.4 mg/dl. The differences between blood sugar, both fasting and random, were statistically highly significant between diabetics and control group (Table-1).

**Table-1: Blood sugar in diabetic and controls**

| Blood sugar | Diabetic (n=50) | | Control (n=50) | |
|---|---|---|---|---|
| | Mean±SD | Range | Mean±SD | Range |
| Fasting (mg/dl) | 218.7±75.5** | 120–583 | 96.2±13.1 | 75–139 |
| Random (mg/dl) | 299.3±81.6** | 192–590 | 140.0±19.4 | 109–200 |

**p<0.001

Serum Cholesterol level of diabetics was 181.2±56.6 mg/dl and that of control group was 171.2±52.5 mg/dl. The difference was statistically non-significant. Triglyceride level of diabetics was 141.7±61.0 mg/dl and that of control group was 126.4±41.2 mg/dl ($p$=0.146). High-density Lipoprotein-Cholesterol (HDL-C) level of diabetic was 29.4±8.6 mg/dl and that of control group was 37.0±12.4 mg/dl. The difference was highly significant. Similarly Low-density Lipoprotein-Cholesterol (LDL-C) level of diabetics was 122.6±51.7 mg/dl and that of control group was 108.4±45.2 mg/dl ($p$=0.146), (Table-2).

**Table-2: Lipid profile in diabetic and Controls**

| | Diabetic (n=50) | | Control (n=50) | |
|---|---|---|---|---|
| | Mean±SD | Range | Mean±SD | Range |
| Cholesterol (mg/dl) | 181.2±56.6 | 60–329 | 171.2±52.5 | 98–321 |
| Triglyceride (mg/dl) | 141.7±61.0 | 52–380 | 126.4±41.2 | 39–263 |
| HDL (mg/dl) | 29.4±8.6** | 13–54 | 37.0±12.4 | 14–74 |
| LDL (mg/dl) | 122.6±51.7 | 30–271 | 108.4±45.2 | 46–234 |

**p<0.001

The prevalence of Hypertension in Diabetic was 76.0% and that of Control group was 58.0%. The difference was statistically significant. The values were given as number and percentages (Table-3).

**Table-3: Hypertension in diabetics and controls**

| Hypertension | Diabetic N (%) | Control N (%) | Total N (%) |
|---|---|---|---|
| Yes | 38* (76.0) | 29 (58.0) | 67 (67.0) |
| No | 12 (24.0) | 21 (42.0) | 33 (33.0) |
| Total | 50 | 50 | 100 |

Chi-square=3.664, *p=0.044

Eighty-eight percent (88.0%) of diabetic patients had dyslipidemia, while only 48% subjects were dyslipidemic in control group. The difference was statistically highly significant (Table-4).

**Table-4: Dyslipidemia in diabetics and controls**

| Dyslipidemia | Diabetics N (%) | Controls N (%) | Total N (%) |
|---|---|---|---|
| Yes | 44** (88) | 24 (48) | 68 (68) |
| No | 6 (12) | 26 (52) | 32 (32) |
| Total | 50 | 50 | 100 |

Chi-square=18.382, **p<0.001

## DISCUSSION

The present study was in accordance with the study of Asia Pacific Cohort Studies Collaboration, which reported that the pattern of dyslipidemia frequently observed in people with diabetes includes raised triglycerides, decreased levels of HDL-C and slightly raised or normal plasma concentrations of LDL-C.[16]

The present study (in our study dyslipidemia affects 88% of patients with diabetes) was also in accordance with study reported that dyslipidemia increases the risk of cardiovascular disease, heart attack and stroke and according to the US Centres for Disease Control and Prevention it affects 70–97% of people with diabetes.[12] The present study was also in accordance with the report of Moroney, which showed that fasting plasma total cholesterol and triglyceride levels were determined at the initial assessment using standard enzymatic techniques.[17] The role of dyslipidemia as causal factor in vascular disease associated with diabetes was previously downplayed because total cholesterol was frequently normal or minimally elevated[18] (this part of the report of Farmer was also in accordance to our study, showed that quantitatively the mean value of serum cholesterol in diabetic and control subjects was $181.2\pm56.4$ and $171.2\pm52.5$ mg/dl respectively, having no significant deference between diabetic and control group ($p$=0.36). However, diabetic dyslipidemia characterised by elevated triglycerides, low high-density lipoprotein, and elevated small, dense low-density lipoprotein, the combination of which has been termed the 'lipid triad'. In the UKPDS trial, tight glycemic control in diabetes was associated with a statistically significant reduction only in microvascular events rates, while the improvements in macrovascular events rates were positively correlated with optimisation of blood pressure and lipid control.[18]

Preliminary data from the Paris Prospective Study (PPS) suggest that triglyceride may be a more important risk factor for cardiovascular disease in diabetic patients than in the general population.[19] In our study although there is no statistical difference of triglycerides between the two groups but the mean value of triglycerides in diabetics ($141.7\pm61.0$ mg/dl) is still higher than the non-diabetic subjects ($126.4\pm41.2$ mg/dl).

The present study was also in agreement with study of Yeo *et al* who reported that Asian Indian, without diabetes had the lowest serum HDL-C, followed by Malays and Chinese. The ethnic differences persisted even in those with diabetes mellitus. This study showed that Asian Indians with diabetes had slightly lower HDL-C than Chinese and Malays with diabetes mellitus.[20]

Several biochemical variables which might be relevant to microvascular or macrovascular disease are monitored at yearly intervals. The routine measurement of triglyceride and of total HDL-C and LDL-Cholesterol will allow assessment of the relative importance of these risk factors. The high prevalence of complications at presentation of type-2 diabetes in middle age suggests that the current organisation of health care is sub-optimal, since diabetes is often diagnosed only when it becomes symptomatic and tissue damage has often already occurred.

## CONCLUSION

Dyslipidemia is a potent predictor of cardiovascular morbidity and mortality in diabetic patients. Regular screening of the population in middle age to detect diabetes before its complications ensue may be required to prevent complications of diabetes.[19]

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