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Correlation of lipid profile in diabetes patients: The potential for risk reducing of atherosclerotic cardiovascular disease

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Abstract---Aim: To determine the pattern of dyslipidemia and the extent to which lipid therapy may reduce the risk of Atherosclerotic Cardiovascular Disease (ASCVD) in individuals with Diabetes. Study design: A retrospective study. Place and Duration: This study was conducted at National Institute of Cardiovascular Diseases Karachi from march 2021 to March 2022. Methodology: During the study, biochemical, clinical, and pharmaceutical profiles of every patient with

Diabetes were compiled. After removing patients with lipid-lowering medication and those with thyroid dysfunction the prevalence of different lipid disorders was calculated. The patients' triglyceride levels, HDL cholesterol and LDL cholesterol and other clinical records were assessed. Based on recommendations from the American Diabetes Association, the effectiveness of statin therapy was evaluated. Results: The total number of 367 patients was incorporated into the study. Forty percent of them had hyperlipidemia. Elevated LDL cholesterol was the most prevalent lipid abnormality. LDL cholesterol levels were shown to be correlated with increased HbA1C and fasting blood glucose readings. Twenty-seven percent of individuals were receiving statin medication. A total of 42.6 percent of individuals on statins had LDL cholesterol levels under 100 mg/dL. Conclusion: Patients with Diabetes in the Pakistani population had fair glycemic control, and high LDL cholesterol was a common lipid abnormality. There is still a significant opportunity in this group to reduce the risk of ASCVD if the knowledge-practice gap is closed.

Keywords---atherosclerosis, cardiac marker, glycemic control, HbA1C, lipid profile.

Introduction

Diabetes Mellitus type 2 (T2DM) is often associated with comorbid conditions such as cardiovascular complications and hyperlipidemia, which are the risk factors in the development of atherosclerotic cardiovascular disease (ASCVD). (1) Furthermore, hyperglycemia is a standalone risk factor for ASCVD. In diabetes mellitus patients, cardiovascular disease is responsible for around two-thirds of deaths; ischemic heart disease accounts for 40%, other types of heart disease, primarily congestive heart failure, for 15%, and stroke, for 10%. (2) Diabetes mellitus patients always have a higher risk for the development of cardiovascular disease (CVD) than that normal healthy individuals. However, the frequencies of complications related to Diabetes mellitus, such as CVD, have reduced in the past 20 years. (3)

It has been clear in recent studies that the fundamental metabolic abnormalities of Diabetes, such as pro-inflammatory, prothrombotic states, poor glucose tolerance, endothelial dysfunction and insulin resistance result in and hasten atherogenesis. (4) Furthermore, cardiac and vascular function changes brought on by diabetes' increased sympathetic tone are linked to cardiac autonomic neuropathy, left ventricular dysfunction and hypertension (5) These changes pave the way for silent infarction, arrhythmia, and death. In the US, patients with T2DM who underwent aggressive risk factor management procedures saw a substantial improvement in their 10-year coronary heart disease (CHD) risk and a reduction in ASCVD morbidity and mortality. (6) Atherosclerosis and CHD are significantly influenced by low-density lipoprotein cholesterol (LDL-C). (7) Multiple advantages of LDL-C decrease in diabetic patients have been documented in the literature. (8) Numerous clinical studies have shown that statin medication

significantly reduces the risk of ASCVD events and CHD death in individuals with Diabetes, both directly and indirectly.(9)

To prevent early death, improve quality of life, and lower the personal and financial burdens of related morbidities, compact productivity, and high medical costs, for the reduction the burden of atherosclerotic cardiovascular disease (ASCVD) in diabetes mellitus should be prioritized.(10) In addition to glycemic control, type 2 diabetes requires effective lipid parameters and hypertension management to prevent chronic sequelae, notably detrimental macrovascular outcomes.

More than 200 million people in the South Asian region live in Pakistan. A recent survey found that more than 30% of Pakistanis will die during the next ten years (7.5%).(11) The most common modifiable risk factors were ASCVD episodes, smoking, hypertension, Diabetes (type II), and high cholesterol. (12) The prevalence of Diabetes is significant in Pakistan, and studies indicate that more than 12% of Pakistani persons over 25 years of age have the disease.(13)

Very few studies of lipid parameters are available for the Pakistani population. Based on compelling evidence from clinical trials, aggressive LDL cholesterol lowering in people with Diabetes is recommended by international recommendations for managing dyslipidemia in individuals with type 2 diabetes. Numerous studies worldwide have shown that treating individuals with Diabetes has therapeutic criteria for controlling their cholesterol, blood pressure and blood sugar levels. This study evaluates the occurrence and pattern of dyslipidemia in a tertiary care hospital in Pakistan and the effectiveness of its treatment.

Methodology

The Ethical Review Committee approved the study. The data was collected from the records of hospital for biochemical, clinical, and medication profiles of patients. Clinical details, diagnosis, therapies, and laboratory findings were noted. All the subjects diagnosed with Diabetes, of either gender, who had visited first time or visited for follow-up and had HbA1C and lipid profiles were included in the study. Patients with severe anemia, alcohol dependence, chronic liver disease of nonalcoholic or alcoholic etiology, on dialysis, subclinical or overt hypothyroidism, pregnancy, breastfeeding, and hypothyroidism were excluded from the study.

For both previously diagnosed and recently diagnosed hyperlipidemia, prevalence rates were calculated. In the study population, the prevalence of statin prescriptions was evaluated. It was also determined how many patients met the criteria for beginning statin medication as recommended by the American Diabetes Association (ADA). Excel 2010 tabulated the data, and SPSS Statistics version 25 was used for statistical analysis. Categorical variables were expressed as percentages and frequencies, whereas continuous variables were expressed as mean and SD. The distribution of the variables was examined to see if they were regularly distributed. For continuous variables, one-way ANOVA and student t-tests were employed.

Results

The study included 421 diabetic individuals who underwent fasting lipid profiling, HbA1C, and serum TSH testing in a single clinic visit. Fifty-four of them were excluded because they had clinically or subclinically hypothyroidism. The remaining 367 patients were incorporated in the present study. Patient mean age in the present study was 49.6 ± 9.18 years. The duration of Diabetes was 8.7 ± 6.3 years. The BMI of patients was 27.2 ± 4.1 kg/m², and the HbA1C was 8.7 ± 2.5 . TLC observed in patients was $1,723 \pm 3216$. It was also examined at how many individuals had LDL cholesterol levels < 100 mg/dL as ASCVD risk factor for in people with diabetes. The current study's mean LDL cholesterol level was 114.4 ± 34.2 mg/dL. In our investigation, low HDL cholesterol was found. The most common abnormalities of the lipid profile in this sample were low HDL cholesterol, and increased LDL cholesterol over the ASCVD cutoff value for risk in people with Diabetes (As shown in Table 1).

The male ratio of 66.7% in the present study was more than the female ratio. About 28 (7.6%) patients were smokers, and hundred and one patients had hypertension. Sixty-two patients were alcoholics, which contributes to hyperlipidemia. Eighty-four patients had anemia, and ESR was raised in 117 (38.9%) diabetic patients. A total of 143 (38.9%) diabetic patients were overweight, whereas 146 (39.7%) were obese (As shown in Table 2).

Patients receiving a statin treatment were compared to those who were not receiving a statin to determine the prescription pattern for statin and attained a level of LDL cholesterol. Statin therapy was more prevalent among patients diagnosed with dyslipidemia than among those who had just received the diagnosis. A total of 110 (30%) of the 367 patients who were under 40 years old and should have received statin medication in accordance with ADA recommendations were doing so. Of the 55 patients under the age of 40, 1 had a low eGFR (60 mL/min/1.73 m²), 14 had microalbuminuria, 32 had a below 100 mg/dL for LDL cholesterol, and 6 had ASCVD in their family history. Hence According to ADA recommendations, 102 of the 110 individuals under the age of 40 should have received statin medication (7). A total of 5 (10.6 percent) of these 46 individuals were being treated with statins. Only 104 (24.7 percent) of the 421 patients who ought to have been receiving statin medication were (As shown in Table 3).

Table 1: Subjects' baseline characteristics (continuous characteristics)

Characteristics	Mean $\pm$ SD
Age (years)	49.6 ± 9.18
Diabetes Duration (years)	8.7 ± 6.3
BMI (kg/m ²)	27.2 ± 4.1
Waist-to-hip ratio	0.93 ± 0.06
Hemoglobin (g/dL)	14.1 ± 0.9
Total leukocyte count (TLC)	$1,723 \pm 3216$
Diastolic blood pressure (mmHg)	73.7 ± 6.9
Systolic blood pressure (mmHg)	129.8 ± 16.08

ESR (mm/hour)	12.8 ± 7.87
LDL cholesterol (mg/dL)	114.4 ± 34.2
HDL cholesterol (mg/dL)	42.18 ± 13.98
Triglycerides (mg/dL)	124.8 ± 71.5
ALT (IU/mL)	39.87 ± 29.07
AST (IU/mL)	33.0 ± 18.6
TSH, mIU/mL	2.2 ± 0.98
Total cholesterol (mg/dL)	187.4 ± 34.2
Serum Cr (mg/dL)	1.04 ± 0.52
eGFR, mL/min/1.73 (m ²)	87.3 ± 45.2
FPG (mg/dL)	181.64 ± 69.76
HbA1C (%)	8.7 ± 2.5
Serum uric acid (mg/dL)	5.21 ± 1.09

Table 2: Subject's Baseline Characteristics (categorical characteristics)

Characteristics	Frequency (%)
Male	245 (66.7)
Smokers	28 (7.6)
Hypertension	101 (27.7)
Alcoholism	62 (16.8)
ESR ≥20 mm/hour	117 (31.8)
Anemia (HB males ≤13 g/dL)(HB females ≤12 g/dL)	84 (22.8)
eGFR ,60 mL/min/1.73 m ²	58 (15.8)
Overweight (BMI ≥23 kg/m ²)	143 (38.9)
Obese (BMI ≥27 kg/m ²)	146 (39.7)
HbA1C (≥7%)	227 (61.8)
Diastolic blood pressure (≥90 mmHg)	47 (12.8)
Systolic blood pressure (≥140 mmHg)	121 (32.9)
Uric acid (≥5 mg/dL)	146 (39.7)
Serum Creatinine (≥ 1.2 mg/dL)	53 (14.4)
Urine albumin-to-creatinine ratio (≥30 mg/g Cr)	99 (27)

Table 3: Ratios of Patients Needing Statin Therapy and Sufficient Rates of Statin Prescription

Categories	Percentage
Patients that require statin treatment	96.4
Patients undergoing statin medication	24.7
Patients under 40 who require statin therapy	82.3
Patients who required statin medication and were receiving it were under 40 years old	10.8
Total number of patients getting enough lipid-lowering treatment	16.0

Discussion

The current retrospective investigation was carried out to assess the prevalence of aberrant lipid profiles and their relationship to atherosclerotic cardiovascular disease. The population's mean age was 49.6 ± 9.18 , ranging from 41 to 85 years. According to the mean BMI of 27.2 ± 4.1 kg/m² in present study the population was not obese but overweight. The HbA1C for the examined cohort was 8.7 ± 2.5 percent. Conventionally, low HDL cholesterol and mild hypertriglyceridemia are considered the predominant lipid abnormalities in Diabetes. The present study evaluated that with ≥ 150 mg/dL and ≥ 250 mg/dL for LDL and TG, LDL was more predominant than hyperlipidemia. Dyslipidemia plays a significant role in the amplified CVD risk seen in South Asians.

People with South Asian ancestry who live in western countries tend to have a lipoprotein pattern characterized by hypertriglyceridemia and low HDL cholesterol levels (HDL-C). LDL cholesterol (LDL-C) levels may not appear excessive. Still, this population has a high incidence of LDL-C particles that are qualitatively aberrant, smaller in size, and have lower densities. (14) According to the ADA's Standards—2019 (15), low level of LDL cholesterol below 100 mg/dL are ASCVD risk factor and should be below 70 mg/dL for those with Diabetes. They have ASCVD already or are at high risk of getting it. In our study, the average LDL levels were 114.4 ± 34.2 mg/dL, and Triglycerides were 124.8 ± 71.5 mg/dL. Similar results were observed in a study carried out in India. (16)

In the present study, high HbA1c and FPG were associated with higher lipid profiles. Another study supported these findings that showed a significant correlation between lipid profile and HbA1c in diabetic patients associated with CVD. (17) This finding suggests that improved glycemic control, as shown by lower levels of FPG and HbA1C, would probably result in TG levels and lower LDL cholesterol in diabetic patients. As a result, medications for lowering lipid may be postponed till glycemic control is reached and a clearer representation of lipid pattern for patient is developed. (18)

The link between higher ESR, LDL cholesterol, and lower HDL cholesterol may indicate low-grade inflammation causing cardiovascular risk. (19) Higher TG levels were linked to increased total leukocyte counts. It was observed that greater TG levels were associated with increased AST, ALT readings and diastolic blood pressure, which may indicate a connection between hepatic inflammation and insulin resistance. Higher mean diastolic and systolic blood pressure, smoking, hyperglycemia prevalence, and BMI were risk factors for ASCVD. (20) An earlier study revealed that Pakistanis who spoke Urdu had a greater risk of ASCVD showed that the <50 age group had a low-risk score of ≤ 7.5 , while the >50 age group had a high-risk score of ≥ 7.5 . (12)

There are numerous recommendations for the primary prevention of atherosclerotic cardiovascular disease when using statins (ASCVD). Few have concentrated on disease-specific conditions that increase the risk of ASCVD. (21) To promote a healthy aging population in light of rising life expectancy, it is crucial to provide clear guidelines on the responsible use of statin medication to

prevent a first, potentially fatal ASCVD incident. (22) Out of 367 patients in this study, only 10.8% of patients used statins < 40 years of age.

A recent study in Pakistan showed that statins were linked to low levels of prescription PIMs (9%). (23) Only 16 percent of the participants in this trial, even those with a prescription for statins, received adequate lipid-lowering treatment. The present investigation adds to the body of knowledge on therapeutic apathy in the treatment of Diabetes. It identifies a potential opportunity further to reduce population risk for ASCVD under study. Limitations of this retrospective study was its limited sample size due to a single-centered study. More hospitals with a large number of patients will help get diverse information which will lead to identifying all factors contributing to ASCVD development in the Pakistani population.

Conclusion

The most common lipid abnormalities in Pakistani patients with type 2 diabetes are increased LDL and low HDL cholesterol. A sizeable fraction of the individuals in this group at high risk for ASCVD who would benefit from statin medication were not getting it. In this population, there is still much room for reducing the risk of ASCVD, provided that the current gap in care based on guidelines is recognized and closed.

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None

Conflict of interest

None

Permission

The ethical review committee approved the study of the institute.

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