

Prevalence and Pattern of Dyslipidemia among Type 2 Diabetes Mellitus Patients in a Tertiary Care Hospital of Punjab

^{*1}Dr Inderpal Kaur, ²Dr Chetna Sharma, ³Dr Aashish Sharma, ⁴Dr Jasmeet Singh

¹Associate Professor, ^{2,3} Junior Resident, ⁴Senior Resident

^{1,2}Department of Pharmacology, ³Department of Forensic Medicine & Toxicology, ⁴Surgical Oncology

^{1,2,3,4} Government Medical College, Amritsar

***Corresponding Author:**

***Dr Inderpal Kaur**

Government Medical College, Amritsar

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ABSTRACT

Introduction: Type 2 diabetes mellitus is directly associated to cardiovascular disease accounting for 52% mortality in diabetic population. Cholesterol levels are directly associated with Cardiovascular diseases. With this context, the study aimed to assess the prevalence and pattern of dyslipidemia in type 2 diabetes mellitus.

Material and Methods: It was a cross-sectional observational study involving 100 diabetic patients conducted from 1st January 2020 to 30 June 2020 in a tertiary care hospital of Punjab. Detailed information including history, demographic profile and investigations performed mainly FBS, HbA1c and lipid profile were taken from the patient and compared to ATP Treatment Panel III guidelines. The dyslipidemia was correlated to FBS and HbA1c. The results were calculated using Microsoft excel.

Results: Out of 100 patients 62 are females and 38 are males with an overall mean age of 57.7 ± 9.77 yrs. The mean FBG, HbA1c, TC, LDL-C, TG and HDL levels are 196.5 ± 75.36 mg/dl, 7.78 ± 1.90 , 200.12 ± 37.81 mg/dl, 119.37 ± 37.72 mg/dl, 183.03 ± 59.15 mg/dl, and 47.34 ± 8.97 mg/dl respectively. Among 100 patients 41% have high TC levels, 54% have high LDL-C levels, 60% have high TG levels and 23% have low HDL-C levels. 27% patients have normal lipid levels. The patients also show abnormality in more than one parameter. A weak positive correlation is seen with FBS and HbA1c.

Conclusion: High prevalence of dyslipidemia is seen among diabetic population of Punjab. Investigations should include lipid profile so that measures could be taken beforehand.

Keywords: Cholesterol, Hypercholesterolemia, Hypertriglyceridemia, dyslipidemia

INTRODUCTION

Diabetes mellitus is a chronic, metabolic disease concerning hyperglycemia due to impaired insulin secretion or development of resistance against it. The common among type 1 and type 2 is type 2 that is non insulin dependent diabetes mellitus.¹ The burden of type 2 diabetes mellitus is increasing and is expected to get dual to a value of 366 million worldwide by the year 2030. India has become the diabetic capital of the world with 79.4 million individuals by year 2030 when compared to China becoming the second followed by USA.²

Diabetes mellitus finally escorts to organ and tissue damage in around 50% of the patients due to various microvascular complications such as retinopathy, neuropathy and nephropathy as well as macrovascular complications such as ischemic heart disease, peripheral vascular disease, cerebrovascular disease and atherosclerosis.³ Many studies have shown a direct association between type 2 diabetes mellitus and Cardiovascular disease making it the most common cause of mortality in diabetic population accounting to 52% deaths.⁴ Diabetics are

recognized as CHD risk equivalents as per international guidelines from National Cholesterol Program - Adult Treatment Panel III (NCP- ATP III).⁵

The glycated hemoglobin serves as gold standard test for the measurement of glycemic control among diabetic population. The higher side of levels point towards poor glycemic control and directly associates to enhanced risk of cardiovascular disease amid diabetic population.⁶ Data from SMART study exposed a connection between HbA1c levels and the cardiovascular events by means of hazard ratio which turned out to be 1.06. It was also noticed that type 2 diabetic patients with no fundamental vascular disease show a 27% increased hazard of cardiovascular events with a 1% rise in HbA1c levels.⁷

Type 2 diabetes mellitus and its features that is defect in insulin action, insulin resistance and the eventual hyperglycemia lays the core of disrupted plasma lipoprotein levels.⁸ There is rise in triglyceride (TG), Low Density Lipoproteins (LDL) and Very Low Density Lipoproteins (VLDL) cholesterol levels and a decline in High Density Lipoprotein (HDL) cholesterol levels which contributes to the high prevalence of cardiovascular disease in diabetic population.⁹ The Strong Heart Study suggested Atherogenic dyslipidemia in form of high triglyceride and low HDL levels to be the basis for 1.32 times greater risk of Coronary Heart Disease than normal TG and HDL levels.¹⁰

Dyslipidemia is believed to be highly prevalent among Indian population with certain regional disparities.¹¹ Our present study aims to see the prevalence and pattern of dyslipidemia among type 2 diabetic population of Punjab and assess if the Fasting Blood Sugar Levels and HbA1c relates to total serum cholesterol levels.

Material and Methods

The study was an observational, cross sectional study conducted in a tertiary care hospital of Punjab over a six month period from 1st January 2020 to 30 June 2020 in 100 patients of type 2 diabetes mellitus. The diabetic patients who visited medicine OPD for routine checkup was considered for the study. The patients were recruited twice weekly. The type 2 diabetic patients more than 18 years of age, of

whichever sex, already on medication or newly discovered with the disease are included in the study. Patients with type 1 diabetes mellitus were not taken up. Patients with coronary artery disease (CAD) or episode of Cerebrovascular accident (CVA) at the time of enrollment were not considered for the study. Patients on lipid lowering therapy were also excluded from the study. After considering enrollment criteria and taking informed consent detailed history of the patient along with demographic profile (age, gender, and regional distribution) was recorded. The reports of investigations including Fasting blood sugar levels after overnight fast of 8 hours, serum lipid parameters that is total cholesterol (TC), triglycerides (TG), low density lipid cholesterol (LDL-C) and high density lipid cholesterol (HDL-C) and Glycated hemoglobin (HbA1c) were recorded. The cut off normal values for all the lipid parameters were taken as per guidelines formed in the third report of the National Cholesterol Education Program on detection, evaluation and treatment of high blood cholesterol in adults (Adult Treatment Panel III). The Cholesterol levels were correlated to FBS and HbA1c. The results were calculated using Microsoft excel. Ethical clearance was not applied as it was an observational study and no intervention was given.

Results

Out of 100 patients, 62% are females and 38% are males with 62% patients have an urban background while just 38% lives in a rural vicinity. The mean age of the patients is 57.8 ± 9.77 yrs (females 57.62 ± 8.63 yrs and males 58.07 ± 11.51 yrs). The majority population is from middle age group with 63% patients from 41-60 yrs age group while only 4% patients are less than or equal to 40 yrs and 33% patients are more than or equal to 60 yrs. Table 1 reveals the prevalence of dyslipidemia among different groups with respect to age, gender and region and no noteworthy disparity is observed in relation to these groups This clearly shows that dyslipidemia have become a challenge despite demographic variations in whole of the diabetic population which needs to be overcome as it straightway leads to the cardiovascular complications. As the study is conducted on diabetic patients, hyperglycemia is detected with the mean Fasting Blood glucose level as 196.5 ± 75.36 mg/dl and HbA1c as 7.78 ± 1.90 . The cut off values for lipid parameters are taken as per NCEP-ATPIII

guidelines which states total cholesterol (TC) >200mg/dl, Low density lipoprotein cholesterol (LDL-C) >100mg/dl, Serum triglycerides (TG) >150mg/dl and High density lipoprotein cholesterol (HDL-C) <40mg/dl as dyslipidemia. Table 2 illustrates the mean value of TC, LDL-C, TG and HDL-C and the number of cases showing hypercholesterolemia (TC >200mg/dl), elevated LDL-C (LDL-C >150mg/dl), hypertriglyceridemia (TG >150mg/dl) and low HDL-C (HDL-C <50mg/dl). 73% of the patients has abnormal lipid profile with just 27% portraying the normal diabetic population. Among the 73% dyslipidemic patients, lipidogram has shown a rise in levels of atleast one of the lipid parameters. The most common observation is hypertriglyceridemia followed by elevated LDL-C, hypercholesterolemia and reduced HDL-C levels. The combinations of two parameters are also observed in patients as illustrated in Table 3. The most common combination observed is hypertriglyceridemia and elevated LDL-C. Two types of mixed dyslipidemia were assessed. The majority formed by hypercholesterolemia with elevated LDL-C with hypertriglyceridemia in 33% patients followed by disruption of all the four parameters in 17% subjects.

As FBG and HbA1c levels are also elevated in diabetics along with the lipid parameters, a relation between FBG and HbA1c with total cholesterol levels is evaluated. Both proved a weak positive correlation with the TC levels. The correlation coefficient of FBS with TC is 0.096 ("p" value 0.94) and that of HbA1c with TC is 0.113 ("p" value 1.12) demonstrating an association which is nonsignificant. This signifies that dyslipidemia is common in diabetics but hyperglycemia has no considerable bearing on the abnormal lipid parameters. The patients having insulin resistance but are prediabetics also have similar dyslipidemia scope which is consistent to the reports submitted by many studies so far.

Discussion

The diabetic population in this study shows a female preponderance which is in accordance with the findings of Daya *et al.*¹² The key bulk is formed by urban population which may be explained on the basis that the tertiary care hospital is situated in urban locality. Majority of the diabetic population belongs

to middle age group which is consistent to the findings of Aderibigbe *et al* which says that diabetes is more common in middle age group.¹³ The present study has observed the slight increase in the prevalence of dyslipidemia among males which is concordant to the study of Kaur *et al.*¹⁴ The regional disparity seen in relation to dyslipidemia in the diabetic population is similar to the study of Tripathy *et al.*¹⁵ High prevalence of dyslipidemia is seen among the Punjabi diabetics which is consistent to the findings of Bali and Vij who reported a dyslipidemia in 81.8% of Punjabi diabetic population. The largest part of the patients has shown hypertriglyceridemia which is similar to the finding of Singh *et al* who also reported hypertriglyceridemia, most common among diabetic population followed by low HDL-C.¹⁶ HbA1c has shown a weak positive correlation with TC levels which is more or less similar to the observation of Alzahrani *et al* that HbA1c is positively but nonsignificantly correlated to TC however the significance may come up when related to TG levels.¹⁷ Julianto *et al* also reported similar results where HbA1c share a weak positive but non significant correlation with TC.¹⁸ However, Singh G and Kumar A, and Chandra and sukla reported significantly positive correlation between HbA1c and TC.^{19,20}

The study discussed the high prevalence of dyslipidemia among Punjabi diabetic patients and its association with the glucose levels in blood. But the study has its own limitations in the form of small sample size and complete dependency on the medical screening, history and investigations reported by the patients. In spite of the shortcomings the study still provides valuable information on diabetic dyslipidemia. The need of the hour is more and more studies on the prevalence so that we get the actual extent of the problem and look for newer measures to tackle with the situation.

Conclusion

Diabetics are more prone to dyslipidemia and the associated high cardiovascular mortality. Punjabis are at a great threat due to their lifestyle and dietary habits which involves a large proportion of ghee in the diet. In order to shun the cardiovascular morbidity and deaths pertaining to it, timely measures need to be taken. Change in dietary habits and other lifestyle

modifications will help a lot to overcome the issue. Routine investigations must include lipid profile so that intervention is done at early stage.

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Table 1:- Dyslipidemia with respect to patient characteristics

Characteristics		No of patients (n=100)	Dyslipidemia (% age)
Age	≤40 yrs	4	75%
	41-60 yrs	63	69.84%
	≥61yrs	33	75.75%
Sex	Male	38	76.31%
	Female	62	70.96%
Region	Urban	62	72.58%
	Rural	38	71.05%

Table 2:- Prevalence of dyslipidemia in study population

Lipid Profile	%age of patients with elevated levels (n=100)	Mean Value (Mean ± S.D)
TC	41%	200.12 ± 37.81
LDL-C	54%	119.37 ± 37.72
TG	60%	183.03 ± 59.15
HDL-C	23%	47.34 ± 8.97

Table 3: Combination of two lipid parameters

Lipid Parameters	%age of cases with elevated levels (n=100)
TC+LDL-C	33%
TC+TG	40%
TC+HDL-C	19%
LDL-C+TG	43%
LDL-C+HDL-C	19%
TG+HDL-C	21%