

Hypertriglyceridemia in Patients with Type II Diabetes Mellitus

Muhammad Fahad Waseem¹, Ayaz Ahmed², Wajeעה Ahad³, Naveed Aslam⁴, Muhammad Arif Khan⁵

ABSTRACT:

Objective: To determine the frequency of type II diabetic patients with hypertriglyceridemia.

Materials and Methods: This was a cross sectional study carried out at medical unit, PAF Hospital Mushaf, Sarghoda from 19th January 2013 to 18th July 2013. A total of 200 patients of either gender having age >30 years with type II diabetes either controlled or uncontrolled for at least 5 years were enrolled in the study. Patients on anti-hyperlipidemic drug, with history of ischemic heart disease, nephrotic syndrome, hypothyroidism and type I diabetes mellitus were excluded from the study.

Results: Mean (\pm SD) age of enrolled participants was 53.25 (\pm 7.5) years. 86 (43%) were males and 114 (57%) were females. Mean (\pm SD) fasting blood sugar level was 135 (\pm 23.04) mg/dl and random blood sugar was 205.62 (\pm 31.87) mg/dl. Mean (\pm SD) duration of diabetes was 6.69 (\pm 1.87) years. Out of 200 patients of type II diabetes, 102 (51%) had hypertriglyceridemia out of which majority (63.7%) of patients had uncontrolled diabetes.

Conclusions: The frequency of type II diabetic patients with hypertriglyceridemia is found to be 51% with majority having uncontrolled diabetes.

Keywords: Type II diabetes, Lipids, Triglycerides, Hypertriglyceridemia, Uncontrolled diabetes

INTRODUCTION:

Hypertriglyceridemia, a metabolic syndrome is commonly found lipid abnormality and is defined as a condition in which levels of triglyceride gets elevated. According to Adult Treatment Panel (ATP) III guidelines hypertriglyceridemia can be categorized as normal <150 mg/dl, borderline high 150-199 mg/dl, high 200-499 mg/dl and very high >500 mg/dl.¹ Globally, by definition of ATP III a third of the population is found to have hypertriglyceridemia. The global prevalence of metabolic syndrome (MetS) is estimated between 7.9%-43% in men and 7%-56% in women. One of the major causes of hypertriglyceridemia is reported to be uncontrolled diabetes mellitus.² Significant association of obesity, relative deficiency and resistance of insulin in body has been reported.³ It has also been observed that after controlling glycemia high triglyceride values and low

levels of high-density lipoprotein in Type I diabetes become normal but in Type II diabetes these abnormalities usually remain elevated.⁴

Diabetes Mellitus is a syndrome of chronic hyperglycemia due to relative insulin deficiency or cells do not respond to the insulin that is produced, that is resistance, or both.⁴ It affects more than 120 million people worldwide, and it is estimated that it will affect nearly 400 to 500 million people by the year 2030.^{5,6} It has also been estimated that between 2010-2030 the number of adults with diabetes mellitus will rise by 69% and 20% in developing and developed countries respectively.⁶ Several other studies have estimated the world-wide prevalence of diabetes.^{7,8,9,10} World health organization (WHO) rated diabetes mellitus as 8th according to its prevalence worldwide and has estimated to be 4th in 2025.¹¹ The two broad categories of Diabetes Mellitus are designated Type I and Type II. Type I Diabetes Mellitus is the result of either complete or near-total insulin deficiency. Type II Diabetes Mellitus is a heterogeneous group of disorders characterized by variable degrees of insulin resistance, impaired insulin secretion, and increased glucose production. Type II diabetes is associated with central obesity, hypertension, hypertriglyceridemia, a decreased HDL-cholesterol, disturbed haemostatic variables and modest increases in a number of pro-inflammatory markers.^{5,12} It has been reported that in comparison to non-diabetic patients, the prevalence of hypertriglyceridemia is 2-3 times higher in type II diabetes patients.¹³ Various studies have shown that both type of diabetes are associated with cardiovascular diseases and various patterns of dyslipidemias are associated with coronary heart disease.¹⁴

In Pakistan prevalence of hypertriglyceridemia in type II diabetes is reported to be 50% to 82%.^{15,16} In China the prevalence of hypertriglyceridemia is reported to be 42% in type II diabetes mellitus.¹⁴ A study done in India in 2015, reported the prevalence of triglyceride in newly diagnosed type-II diabetes patients as borderline high TLG 30.6%, high TLG 6.8% and very high TLG 4%. The study also reported that majority (95%) patient's TLG got normal after 3 months and concluded that

✉ **Dr. Muhammad Fahad Waseem**

Medical Specialist
PAF Hospital, Shahbaz
Jacobabad

Email: msfahad_81@hotmail.com

✉ **Dr. Ayaz Ahmed**

Medical Specialist
PAF Hospital, Samugli
Quetta

✉ **Dr. Wajeעה Ahad**

Medical Specialist
PAF Hospital, Korangi
Karachi

✉ **Dr. Naveed Aslam**

Medical Specialist
PAF Hospital
Lahore

✉ **Dr. Muhammad Arif Khan**

Medical Specialist
PAF Hospital Mushaf
Sargodha

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hypertriglyceridemia is not the source of diabetes however uncontrolled diabetes can cause hypertriglyceridemia.¹⁷ Another study done in 2015 in Pakistan reported 33%, 46.6% and 20% prevalence of less severe, moderately high and most severe triglyceride levels in type-II diabetes patients respectively.¹¹

Rationale of this study is to determine the frequency of hypertriglyceridemia in Type II diabetics, because data shows variability as evidenced by comparing international study¹⁴ with local studies^{15,16} that show a significant difference in frequency of hypertriglyceridemia. Present study was designed to determine the frequency of type II diabetic patients with hypertriglyceridemia so as to reassess it in our population the exact magnitude of hypertriglyceridemia. Early identification of diabetic dyslipidemia, including hypertriglyceridemia in type 2 diabetes and its effective management in time not only may decrease the morbidity, but also may decrease mortality due to the complications of diabetes such as stroke, ischemic heart disease etc.

MATERIALS AND METHODS:

This was a cross sectional study carried out at medical unit, PAF Hospital Mushaf, Sarghoda from 19th January 2013 to 18th July 2013 after approval from hospital ethics committee. A total of 200 patients of either gender having age >30 years with type II diabetes either controlled or uncontrolled for at least 5 years were enrolled in the study. Patients on anti-hyperlipidemic drugs, with history of ischemic heart disease, nephrotic syndrome, hypothyroidism and type I diabetes mellitus were excluded from the study. The sample size was calculated with 80% power 95% confidence interval, 7% margin of error and 50% prevalence of hypertriglyceridemia in type II diabetes.

Demographic information of all the patients was recorded on a pre-designed questionnaire. After 12 hour overnight fasting patients were sent to the hospital laboratory, where blood sample was taken and placed in chemistry analyzer on same day and serum triglyceride level was measured using triglycerides kit manufactured by Merck. Hypertriglyceridemia was declared for patients with serum Triglyceride levels > 2.3 mmol/l (200 mg/dl). Data was entered and analyzed using statistical package SPSS version 21.0. Mean ± SD was calculated for all the quantitative variables. All the qualitative variables were presented as frequency and percentage. Chi-square test was used to assess significant association of duration of diabetes, status of diabetes (controlled/uncontrolled) with hypertriglyceridemia. P-value<0.05 was considered significant.

RESULTS:

Out of 200 patients, 86 (43%) were males and 114 (57%) were females with male to female ratio of 1:1.3. Mean ± SD age of enrolled participants was 53.25±7.5 years. Average (±SD) fasting blood sugar level was 135 (±23.04) mg/dl; random blood sugar was 205.62 (±31.87) mg/dl. Half of the patients (50.5%) had controlled diabetes. The mean (±SD) duration of diabetes was 6.69

(±1.87) years. Majority (57.5%) of the patients had duration of disease < 5 years and 42.5% had = 5 years (Table 1). Overall 51% (102) of the patients were found to have hypertriglyceridemia with 36.3% had controlled diabetes and 63.7% had uncontrolled diabetes. However, patients with no hypertriglyceridemia majority (65.3%) had controlled diabetes and 34.7% had uncontrolled diabetes (P<0.0001, Table 2). Those who had hypertriglyceridemia, 53.9% had duration of disease = 5 years and 46.1% had duration of disease < 5 years (P-value=0.001)(Table 2).

Table: 1
Characteristics of study population

Age in years	
Mean ± SD	53.25 ± 7.5
Fasting blood sugar (mg/dl)	
Mean ± SD	135.81 ± 23.04
Random blood sugar (mg/dl)	
Mean ± SD	205.62 ± 31.87
Serum triglyceride levels	
Mean ± SD	205.62 ± 31.87
Duration of disease in years (mg/dl)	
Mean ± SD	206.34 ± 18.6
Age groups; n (%)	
<5 years	104 (52)
= 5 years	96 (48)
Duration of disease; n (%)	
<5 years	115 (57.5)
= 5 years	85 (42.5)
Gender; n (%)	
Male	86 (43)
Female	114 (57)
Male : female ratio	1 : 1.3
Status of diabetes; n (%)	
Controlled	101 (50.5)
Uncontrolled	99 (49.5)
Hypertriglyceridemia; n (%)	
No	98 (49)
Yes	102 (51)

Table: 2
Association of duration of disease and diabetes status with hypertriglyceridemia

	Hypertriglyceridemia			P-value
	No n (%)	Yes n (%)	Total n (%)	
Duration of disease				
<5 years	68 (69.4)	47 (46.1)	115 (57.5)	0.001*
= 5 years	30 (30.6)	55 (53.9)	85 (42.5)	
Total	98 (100)	102 (100)	200 (100)	
Diabetes status				
Controlled	64 (65.3)	37 (36.3)	101 (50.5)	0.000**
Uncontrolled	34 (34.7)	65 (63.7)	99 (49.5)	
Total	98 (100)	102 (100)	200 (100)	

*P-value<0.05, **P-value<0.0001, Chi-square test

DISCUSSION:

Type 2 diabetes is associated with a cluster of interrelated plasma lipid and lipoprotein abnormalities, including reduced HDL cholesterol, a predominance of small dense LDL particles, and elevated triglycerides.¹⁸ These abnormalities occur in many patients despite normal

LDL cholesterol levels. These changes are also a feature of the insulin resistance syndrome (also known as the metabolic syndrome), which underlies many cases of type 2 diabetes.¹⁹ In fact, pre-diabetic individuals often exhibit an atherogenic pattern of risk factors that includes higher levels of total cholesterol and triglycerides and lower levels of HDL cholesterol than individuals who do not develop diabetes.^{20,21} Insulin resistance has striking effects on lipoprotein size and subclass particle concentrations for VLDL, LDL, and HDL.²² There is evidence that each of these dyslipidemic features is associated with increased risk of cardiovascular disease, the leading cause of death in patients with type 2 diabetes. Numerous studies have demonstrated an association between elevated triglycerides and coronary artery disease (CAD).^{23,24} Moreover, recent reports have indicated that elevated LDL and serum triglycerides, are predictive of coronary events and that this is independent of other coronary disease risk factors.^{21,25} In this study we found that 51% of patients had hypertriglyceridemia in patients with type II DM. We also found that the proportion of hypertriglyceridemia in patients with duration of diabetes \geq 5 years was 53.9% compared to patients with duration of diabetes < 5 years 46.1% (P-value=0.001) and uncontrolled DM was 63.7% compared to controlled DM 36.3% (P-value <0.0001). Studies in Pakistan have reported that proportion of hypertriglyceridemia ranges from 50-82%.^{15,16} In a study carried out in China has reported 42% prevalence of hypertriglyceridemia in Type II Diabetes Mellitus.¹⁴ So our results are well found within the range of above mentioned prevalence. The strength of this study is that we measured fasting serum triglyceride which is better indicator to assess risk of CAD. European Society of Cardiology (ESC) guidelines specifies treatment targets based on fasting triglyceride levels. However, some studies were unable to ascertain whether triglyceride levels were measured in the fed or fasting state. Fasting levels may reduce uncertainties associated with differences in the time of postprandial phlebotomy. However, postprandial lipids, partially hydrolyzed chylomicron, and very-LDL remnants apparently accelerate atherogenesis by exacerbating endothelial dysfunction, augmenting numbers of atherogenic small LDL particles, and promoting thrombosis and inflammation. Arguably, therefore, postprandial TG more accurately predict vascular risk than fasting levels.²¹ As a result, both fed and fasting hypertriglyceridemia are associated with increased CVD risk. The high frequency of hypertriglyceridemia identified in this audit suggests that TG is often undertreated.

The results of this study have some implications for management. The clinicians should continue to emphasize that all patients should follow dietary advice and exercise regularly to improve glycemic control and lipid profiles, as well as implementing interventions to optimize compliance with lifestyle changes, and lipid-lowering and other medications.

CONCLUSION:

The frequency of type II diabetic patients with hypertriglyceridemia is found to be 51% with majority having uncontrolled diabetes.

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