ORIGINAL RESEARCH

An analytical study to assess the association of post prandial hypertriglyceridemia and carotid intima-media thickness in patients with type 2 diabetes mellitus

[1]Dr. Uday Girijakanth, [2]Dr. Amulya Visweswar, [3]Dr. Prashanth N C

[1,3]Assistant Professor, Department of General Medicine, Sri Siddhartha Institute of Medical Sciences and Research, T Begur, Bangalore Rural, Karnataka, India
[2] Assistant Professor, Department of General Medicine, B G S Global Institute of Medical Sciences, Bengaluru, Karnataka, India

Corresponding author
Dr. Amulya Visweswar
Assistant Professor, Department of General Medicine, B G S Global Institute of Medical Sciences, Bengaluru, Karnataka, India
Email: dr.amulya.v@icloud.com

ABSTRACT
Introduction: Epidemiological studies have demonstrated that type 2 diabetes mellitus is a well-known risk factor for the development of cardiovascular disease, cerebrovascular disease and peripheral vascular diseases. Dyslipidemia is a risk factor for coronary artery disease, a leading cause of mortality in patients with Diabetes mellitus. Dyslipidemia remains largely undiagnosed and under treated in high risk populations, such as patient with type- 2 diabetes. **Aim:** to study the association of post prandial hypertriglyceridemia and carotid intima-media thickness in patients with type 2 Diabetes Mellitus. **Method:** A total of 50 patients of type 2 diabetes mellitus admitted to the DR B.R. Ambedkar medical college and hospital, Bangalore between November 2015 to April 2017, who consented for the investigations were included for this study. Carotid intima media thickness was measured by ultrasonography in these patients. **Results:** The comparison of carotidintima media thickness among the three groups showed statistical significance in the groups NNvs NH(p value – 0.001)and NN vs HH (p value-<0.001). In this study, there is a significant correlation of CIMT with FTG and PPTG. **Conclusion:** The present study suggests that levels of both the fasting triglycerides and postprandial hypertriglycerides correlate well with Carotid intima media thickness
Keywords: Diabetes, carotid intima thickness, cardio-vascular disease

INTRODUCTION
Globally, diabetes is one of the most common non-communicable diseases. It is worldwide in distribution and the incidence of both type 1 and type 2 diabetes is rising dramatically. The worldwide prevalence of DM has risen significantly from as estimated 30 million cases in 1985 to 285 million in 2010. Based on the current trends, 552 million individuals will have diabetes by the year 2030 with majority of individuals in the most productive age group [1,2] Diabetic patients have a greater likelihood of having dyslipidemia, hypertension, and obesity. Because early detection and prompt treatment may reduce the burden of diabetes and its complications, screening for diabetes may be ideal under certain circumstances.

Epidemiological studies have demonstrated that type 2 diabetes mellitus is a well-known risk factor for the development of cardiovascular disease, cerebrovascular disease and peripheral vascular diseases. Dyslipidemia is a risk factor for coronary artery disease, a leading cause of mortality in patients with Diabetes mellitus. Dyslipidemia remains largely undiagnosed and under treated in high risk populations, such as patient with type- 2 diabetes[3]
Recent studies have shown that the postprandial triglyceride levels are an important factor determining atherosclerosis. Human beings have a habit of having multiple meals in the form of snacks in between. The normal people with steady fasting triglycerides, also often show increased postprandial triglycerides. In normal healthy people triglycerides are raised for

about 3-4 hours after meals, while in diabetics and prediabetics, levels are raised for 6-10 hours.

Usually, serum lipid concentration including triglycerides is measured after an overnight fast. But the fasting values are the lowest of a 24 hr triglyceride profile and thus can be misleading. However, several previous studies have lamented raised postprandial Triglyceride Rich Lipoprotein to be related to coronary artery disease in diabetic and nondiabetic subjects [4]

Cardiovascular disease is increased in individuals with type 1 or type 2 DM. In patients with DM, cardiovascular disease is the major cause of morbidity and mortality. Infact, diabetes is considered as a coronary equivalent. Approximately 80% of all deaths and more than 75% of all hospitalizations in patients with diabetes are due to CVD-primarily complication of CHD [5].

It would appear logical therefore that most of the events that lead finally to atherosclerosis would be taking place in the postprandial state. Therefore measurement of serum triglycerides in the postprandial state may provide a more reliable and sensible estimate of hypertriglyceridemia especially among diabetic subjects.

The carotid intima media thickness (IMT) is increased in patients with postprandial hypertriglyceridemia despite normal fasting triglyceride levels. So to investigate the role of postprandial hypertriglyceridemia in early atherosclerosis there is a need to correlate between postprandial triglyceride levels and carotid intima media thickness values. Aim of the present study was to study the association of post prandial hypertriglyceridemia and carotid intima-media thickness in patients with type 2 Diabetes Mellitus.

METHOD
A total of 50 patients of type 2 diabetes mellitus admitted to the DR B.R. Ambedkar medical college and hospital, Bangalore between November 2015 to April 2017, who consented for the investigations were included for this study. Carotid intima media thickness was measured by ultrasonography in these patients. FBS, PPBS, fasting triglycerides (FTG), total cholesterol, LDL, HDL, VLDL levels were measured. Postprandial triglyceride level (PPTG) was measured after overnight fast and 4 hours after a meal.

RESULTS
The study group consisting of 50 patients were divided as shown in the table below, based on the fasting and postprandial levels.

Table 1: Classification of the study group based on ft gand ppt g values.

Classification	Number	%
1)Normo-NormalGroup (NN) (FTG ≤ 150 mg/dl; PPTG ≤ 200mg/dl)	17	34.0
2)Normo-Hyper Group (NH)(FTG ≤ 150 mg/dl; PPTG > 200mg/dl)	18	36.0
3)Hyper-Hyper Group (HH)(FTG>150mg/dl;PPTG>200 mg/dl)	15	30.0
Total	50	100.0

The age of the patients varied from a minimum of35 years to a maximum of 60 years. The mean age of the patients in the NN, NH and HH group were 52.1, 50.9, 52.7years respectively. The mean duration of diabetes in the NN, NH and HH group were 9.1, 9.1 8.9 years respectively. The mean duration of diabetes in our study was 9.03years.

Table 2: Comparison of mean scores of lipid profile parameters between 03 groups

Comparison of mean scores of Lipid profile Parameters among Diabetics between 03 groups using One-way ANOVA test								
Variables	Groups	N	Mean	SD	Min	Max	F	P-Value
T.C	NNGroup	17	140.41	31.11	76	188		
	NHGroup	18	187.33	28.80	147	267		
	HHGroup	15	166.40	25.41	126	232	11.730	<0.001*
HDL	NNGroup	17	36.76	5.86	20	45		
	NHGroup	18	39.37	7.42	30	54		
	HHGroup	15	36.00	6.70	22	45	1.174	0.32
LDL	NNGroup	17	80.24	23.78	42	113		
	NHGroup	18	112.78	24.49	53	159		
	HHGroup	15	91.00	27.21	34	151	7.646	0.001*
VLDL	NNGroup	17	25.65	7.40	14	43		
	NHGroup	18	39.00	12.01	22	59		

	HHGroup	15	40.07	14.78	19	76	7.944	0.001*
FTG	NNGroup	17	98.94	19.20	65	130		
	NHGroup	18	135.33	14.85	115	182		
	HHGroup	15	224.60	55.47	154	316	58.691	<0.001*
PPTG	NNGroup	17	151.24	31.30	90	186		
	NHGroup	18	286.06	51.90	212	401		
	HHGroup	15	335.40	97.38	164	506	35.980	<0.001*

Table 3: Comparison of mean carotid intima media thickness among diabetics between the 3groups.

Comparison of mean Carotid Intima Media Thickness(in mm) among Diabetics between 03groups using One- Way ANOVA test followed by Tukey's HS Dposthoc Analysis										
Variables	Groups	N	Mean	SD	Min	Max	F	P-Value	Sig. Diff	P-Value
CIM (mm)	NN Group	17	0.866	0.294	0.47	1.46	14.791	<0.001*	NNVs NH	0.001*
	NH Group	18	1.474	0.568	0.76	2.64			NNVs HH	<0.001*
	HH Group	15	1.751	0.518	0.80	2.64			NHVs HH	0.23

The comparison of carotid intima media thickness among the three groups showed statistical significance in the groups NN vs NH(p value – 0.001) and NN vs HH (p value-<0.001). In this study, there is a significant correlation of CIMT with FTG and PPTG. FTG showed moderate correlation (r = 0.59) as compared to PPTG which showed a strong correlation (r=0.71) with CIMT. Both FTG and PPTG have a positive correlation with carotid intima media thickness according to the study which tells us that any increase in the FTG/ PPTG values would further increase the CIMT values (positive correlation).

DISCUSSION
Although several studies have shown fasting triglyceride levels to be associated with Coronary artery disease in both diabetic and non-diabetic subjects, relatively little attention has been given to post prandial triglycerides in this regard, especially in diabetic subjects.

In the present study, it was observed that carotid intima media thickness (CIMT) was increased in patients with post prandial hyper triglycer idemia despite normal fasting triglyceride levels, and the postprandial triglyceride levels showed the strongest influence on CIMT.

It is observed from this study that the mean CIMT in patients with post prandial hypertriglyceridemia (HH group) was significantly greater than that in patients with normal FTG and PPTG levels (NN group)(1.751 mm vs 0.866mm, p<0.001).

In conclusion, our result showed similarity to the study done by Rao et al7 and Sharma et al8, where it was observed that CIMT was increased in patients with post prandial hypertriglyceridemia despite normal FTG levels, and the PPTG levels showed the strongest influenceon CIMT

It is evident that postprandial dyslipidemia can induce oxidative stress and endothelial dysfunction since endothelial dysfunction is accompanied by a significant nitricoxide increase. The mean duration of diabetes in our study was 9.03 years , which is similar to the observations made by Kumar et al and Rao et al7 . Longer the duration of the disease more the risk for dyslipidemia and cerebrovascular disease.

CONCLUSION
The present study suggests that levels of both the fasting triglycerides and postprandial hypertriglycerides correlate well with Carotid intima media thickness. Hence can cause atherosclerosis in patients with Type II Diabetes Mellitus. Thus, these investigations are must in such cases, however the correlation between increased PPTG and CIMT is even stronger (r= 0.71). Thus PPTG is an independent risk factor for atherosclerosis.

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