Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublisher.com/sjams/

OPEN ACCESS

Medicine

Correlation of Serum Triglyceride level with Carotid Intima Media Thickness in Type-2 Diabetes Mellitus patients

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DOI: 10.36347/sjams.2020.v08i01.058 | **Received:** 20.01.2020 | **Accepted:** 27.01.2020 | **Published:** 30.01.2020

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Abstract **Original Research Article**

Background: Type-2 Diabetes Mellitus (T2DM) with cardiometabolic risk factors poses the high risk of atherosclerosis. The Intima-Media Thickness (IMT) of carotid artery is reliable indicator of cardiovascular diseases. ***Aims and objectives:*** To study the Correlation of Serum Triglyceride level with Carotid Intima-Media Thickness (CIMT) in Type-2 Diabetes Mellitus patients. ***Materials and Methods:*** Presentretrospective study was performed on 250 T2DM patients at Department of Medicine, Gandhi Medical College and associated Hamidia Hospital from January 2018 to March 2019. T2DM patients having age 25-65 were enrolled. CIMT was measured with ultrasonography and its correlation was checked with triglyceride serum level. ***Results:*** Out of 250, 152 were male and 98 were females. Mean age of cohorts was 53.03 years. out of 250 subjects only 79 has normal fasting triglyceride (FTG) and post prandial triglyceride (PPTG) (mean CIMT was 0.95±0.27), 88 subjects has abnormal PPTG and normal FTG with (mean CIMT 1.63±0.40 mm) and 83 subjects had abnormal FTG and PPTG i.e. ≥150 mg/dl and significantly high CIMT as 1.96±0.61 mm. ***Conclusion:*** FTG and PPTG levels are significantly correlated with the carotid intima media thickness. PPTG is indecently and strongly associated with CIMT.

Keywords: carotid intima media thickness, type-2 diabetes mellitus, pre diabetes, impaired fasting glucose, glucose tolerance.

INTRODUCTION

Diabetes mellitus (DM) is a major metabolic disorder affecting a large population globally. Type 2 DM (T2DM) is a common endocrine disorder which causes the insulin resistance and metabolic abnormalities. Insulin resistance is a multifaceted syndrome which increases the risks of cardiovascular disease. There are many complex links between insulin resistance and the associated dyslipidaemia, hypertension, hypercoagulability, and atherosclerosis [1].

Dyslipidemia includes the risk factors of decreased concentration of high-density lipoprotein (HDL) cholesterol as well as qualitative changes in low density lipoprotein (LDL) these abnormalities, with raised triglycerides, are indicators of coronary heart disease [2].

T2DM is known for causing the premature atherosclerosis whose complications are precursor of cardiovascular morbidity and mortality. Lipid abnormality in T2DM is characterized by high triglyceride concentration particularly post prandially (post prandial lipidemia), low HDL and normal or high concentration of LDL [3].

High-resolution carotid ultrasonography is non-invasive technique to measure the IMT of the carotid arteries. B- Mode ultrasonography shows that the IMT of carotid arterial walls of T2DM patients are thicker than the non-diabetic patients. The carotid IMT is widely used and accepted marker for atherosclerotic ailments [4].

There are not many studies conducted to assess the correlation of serum triglyceride level with CIMT in T2DM patients and therefore this study is planned to asses this correlation.

MATERIALS AND METHODS

This study was conducted at Gandhi Medical College and associated Hamidia Hospital from Jan 2018 to March 2019. As part of this study 250T2DM were enrolled based on the inclusion criteria of written and formal consent, T2DM patients and age between 25 to 65 years.

Patients who have not given the consent or having of type 1 diabetes mellitus or having history of cardiovascular disease or diagnosed atherosclerosis (carotid IMT > 1.4 mm) or suffering from hypertension or experience stroke or if on any medication other then T2DM were excluded from the study cohort.

For this study a detailed medical history of the subjects was recorded, physiological variables i.e. heights, weight were recorded body mass index (BMI) was calculated. Clinical and bio-chemical examinations mainly lipid profile test, blood sugar test, urine test and levels of haemoglobin A1c (HbA1c) was measured.

Fasting venous blood samples were collected to measure the Triglyceride (TG), TC, LDL-C, HDL-C, creatine kinase (CK), high sensitivity C-reactive protein (hs-CRP) and fasting blood glucose.

Carotid ultrasound examination conducted on both the left and right carotid arteries using high-resolution B-mode ultrasound scanners. CIMT was measured using the 7.5 MHz linear transducer probe.

All the data analysis was performed using SPSS ver. 20 software. Quantitative data is expressed as mean and standard deviation whereas categorical data is expressed as number and percentage. Descriptive analysis was performed to obtain the baseline values of study population.

RESULT

Current study recorded the results of various tests the mean ± standard deviation (SD) of results from all the 250 subjects. Table 1 records the results of anthropometric and bio-chemical examinations. Out of 250 152 were male and 98 were females. Mean age of cohorts was 53.05 years (min= 26 and max=64 years).

Table-1: Showing baseline parameters of the study population

Baseline parameters	Mean ± standard deviation
Age(years)	53.05±10.2
BMI (kg/m^2)	27.95±9.95
Total cholesterol (mg/dl)	300.51±133.04
Triglyceride (mg/dl)	425.10±285.41
LDL (mg/dl)	150.01±73.02
HDL (mg/dl)	42.01±14.05
HbA1c (%)	8.1±2.5

Data is expressed as mean ± standard deviation. BMI; body mass index, LDL; low density lipoprotein, HDL; high density lipoprotein, HbA1c; glycated haemoglobin

Triglyceride levels at fasting and post prandial triglyceride recorded as out of 250 subjects only 79 has normal fasting triglycerides (FTG) and post prandial triglyceride(PPTG)i.e. ≤150 mg/dl, 88 subjects has PPTG ≥150 mg/dl and 83 subjects had both FTG and PPTG above normal i.e. ≥150 mg/dl.

Carotid arteries IMT of all subjects was measured and recorded based on the triglyceride levels. In the subjects having normal FTG and PPTG the mean CIMT was 0.95±0.27mm (min 0.55 and max 1.7 mm). In subjects having abnormal PPTG the mean CIMT was 1.63±0.40 mm (min 0.89 and max 2.5 mm). In subject with abnormal FTG and PPTG the mean CIMT was 1.96±0.61 mm (min 1.3 and max 2.9 mm). This observation indicates that the CIMT increases with triglyceride levels hence increases the risks of CVD.

Table-2: Showing Relationship between triglyceride levels and CIMT

Triglyceride levels	FTG ≤150 mg/dl and PPTG ≤150 mg/dl	FTG ≤150 mg/dl and PPTG ≥150 mg/dl	FTG ≥150 mg/dl and PPTG ≥150 mg/dl
No	79	88	83
%	31	36	33
Min CIMT(mm)	0.55	0.89	1.3
Max CIMT(mm)	1.7	2.5	2.9
Mean ± SD CIMT(mm)	0.95±0.27	1.63±0.40	1.96±0.61

Relationship between of fasting blood sugar (FBS), post prandial blood sugar (PPBS) and CIMT was recorded in all the patients. In patients having normal FBS i.e. <150 mg/dl the mean CIMT was 1.49±0.59 mm(min 0.59 and 2.49 max mm)and in patients having FBS above normal levels the recorded mean FBS was 1.45±0.50 mm (0.78 min and 2.59 max in mm).

Subject with normal PPBS mean CIMT was 0.88±0.52 mm (0.71 min–1.78 max in mm) and in patients with abnormal PPBS the recorded mean CIMT was 1.82 ±0.6 (0.59 min and 2.79 max in mm). Statistical analysis of various other bio-chemical variables reveals that the LDL and HDL are not insignificantly and triglyceride is significantly associated with the thickness of carotid.

DISCUSSION

Present study reveals that the CIMT increases with the increased triglyceride levels, subjects having normal FTG and PPTG the mean CIMT was 0.95±0. In subjects having abnormal PPTG the mean CIMT was 1.63±0.40 mm. In subject with abnormal FTG and PPTG the mean CIMT was 1.96±0.61 mm. Similar observations were made by Teno *et al*. where the CIMT of the patients with fasting hypertriglyceridemia was greater than that of the patients with normal FTG levels (0.85+/-0.12 vs. 0.76+/-0.14 mm; P = 0.02). The carotid IMT was increased in the patients with PPTG levels >2.27 mmol/l[5].

Similarly Mory *et al*. also recorded that the CIMT value was significantly higher in diabetic patients with abnormal (above 150 mg/dl) FTG and PPTG as compared to that of in those with normal triglyceride levels [6] Dharmalingam *et al*. in similar study have also observed that fasting triglyceride levels are significantly correlated with the CIMT[7].

In the present study recorded higher CIMT in patients with high PPTG level irrespective of FTG levels. Similarly, Ahmed *et al*. also concluded that PPTG level is better and independent gauge of CIMT in T2DM patients than the FTG level [8].

Current study indicates that the abnormal PPTG even with normal FTG poses significant risk of early atherosclerosis in T2DM patients. Observation of Ahmed *et al*. also shows that PPTG level significantly influence the CIMT valued.

Xiang *et al*. observed that the CIMT in patients with postprandial hypertriglyceridemia was significantly greater than that in patients with postprandial normal triglyceride level ($p<0.05$), which remained significant after adjustment for fasting triglyceride level [9].

Present study did analyse the blood sugar levels for correlation with the CIMT values. FBS found to be insignificant factor for the CIMT value. Similar observations were made by Esposito *et al*. that the CIMT is not correlated to the PFBS ($p>0.005$).

However, this study found that PPBS is significantly correlated with the CIMT ($p<0.01$) values. These observations are supported by the results of similar study of Esposito *et al.* which record that the PFBS is statistically significant factor for the CIMT [10].

Small sample size and cross sectional nature were the main limitations of the study. There is a need to perform a large randomized comparative trial with the control to provide strength to the present study.

CONCLUSION

Based on the recoded observation this study concludes that the FTG and PPTG are significantly correlated with the thickness of carotid intima media. However, PPTG level is an independent and strong indicator of CIMT. FBS is found to be insignificant but PPBS is significant factor of CIMT values. Based on the gathered observations present study suggest that in T2DM patients FTG and PPTG should be considered as part of routine check-ups to identify and prevent he cardio vascular complications.

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