TRIGLYCERIDE-GLUCOSE INDEX IN PATIENTS OF CORONARY ARTERY DISEASE PRESENTING WITH OR WITHOUT CARDIOVASCULAR EVENT

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ABSTRACT:

INTRODUCTION:	*Insulin resistance is a significant risk factor for coronary artery disease. A helpful surrogate test for insulin resistance is the triglyceride-glucose index, which measures how well glucose and triglycerides are metabolized.*
AIMS & OBJECTIVE:	*The purpose of this research is to determine the frequency of cardiovascular event after coronary artery diseases and compare the triglyceride-glucose index in patients presenting with or without cardiovascular event after coronary artery disease.*
MATERIAL & METHODS:	*The study was conducted at the Department of Cardiology, Punjab Institute of Cardiology in Lahore from June 5, 2020 to December 5, 2020. Total 150 patients were enrolled in the study. Patients who had and did not have a cardiovascular incident had their reports evaluated, and the triglyceride-glucose index was determined for both groups. Triglyceride-glucose index was compared in patients with or without cardiovascular event by using independent samples t-test.*
RESULTS:	*In patients having coronary artery disease, the frequency of cardiovascular events was 32, which represents 21.3%. The individuals who had a cardiovascular incident had a mean value of the triglyceride-glucose index of 9.48±0.52 and in patients of without cardiovascular event was 8.75±0.56. The level of triglyceride-glucose index was high in patients of cardiovascular event than the patients of without cardiovascular event when compared by using independent sample t-test the difference is significant (p=0.000001).*
CONCLUSION:	*There is significant difference in triglyceride-glucose index in patients with or without cardiovascular event and the index is high in patients of cardiovascular event. On the basis of these results we recommend the regular screening of patients for triglyceride-glucose index in order to predict the adverse consequences after coronary artery disease.*
KEY WORDS:	*Triglyceride-Glucose Index, Coronary Artery Disease, Cardiovascular Event.*

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INTRODUCTION

More than three million people die of cardiovascular disease every year as a direct result of increased blood glucose levels, diabetes mellitus, or the coexistence of both conditions. By the year 2030, it is anticipated that the global prevalence of diabetes would have increased by a factor of two due to increase in the rates of obesity, insulin resistance, and the metabolic syndrome. The burden of cardiovascular disease that may be attributed to diabetes is expected to increase as the diabetes epidemic continues to grow.[1] Patients who suffered from clinical cardiovascular disease as well as diabetes were categorized as being at an extremely high risk.[2] In spite of recent advances in therapeutics and the widespread use of percutaneous coronary intervention, it is still unknown whether diabetes's increased risk of acute coronary syndrome has decreased as a result of these developments.[3]

When determining whether or not a patient is at risk for coronary artery disease, a clinical lipid profile might be helpful. However, the standard lipid profile, which includes total cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides, is unable to identify whether individuals would have a stable or acute presentation of their condition.[4] Due to the fact that these lipoprotein particles play distinct roles in the pathogenesis of atherosclerosis, it is possible that monitoring lipids within lipoprotein particle families will produce more sensitive indicators of disease presentation.[5-6] Insulin resistance is a significant risk factor for coronary artery disease. A helpful surrogate test for insulin resistance is the triglyceride-glucose index, which measures how well glucose and triglycerides are metabolized. However, there is a dearth of information about the connection between the triglyceride-glucose index and the features of coronary plaque.[7]

The triglyceride-glucose index, which is the combination of both indicators, has been observed to be highly connected with insulin resistance. Furthermore, it has been recommended a viable surrogate measure of insulin resistance as a result of this significant correlation.[8] However, the majority of the research that were relevant concentrated on the effect that metabolic illnesses had on the triglyceride-glucose index.[9-11] Jin JL reported that among patients of coronary artery disease, cardiovascular event occurred in 16.7% in patients. In patients with cardiovascular event, the mean Triglyceride-glucose index was 8.91±0.66 while in patients without cardiovascular event, the mean Triglyceride-glucose index was 8.80±0.57. The difference was significant (p<0.05).[12]

Rationale of this study was to determine the frequency of cardiovascular event after coronary artery diseases and compare the triglyceride-glucose index in patients presenting with or without cardiovascular event after coronary artery disease. Literature showed that there is significant difference in triglyceride-glucose index in patients with or without cardiovascular event and the index is high in patients of cardiovascular event, but not much work has been done in this regard.

Additionally, there is no local study that has been published in the relevant literature that might assist us in establishing the scope of the problem in the local community, and the likelihood of having an elevated glycemic level and dyslipidemia is rather significant in Pakistan. Therefore, we want to carry out this study in order to collect data from the local area. So that in future we can apply results of this study and can recommend the regular screening of patients for triglyceride-glucose index in order to predict the adverse consequences after coronary artery disease and we may plan preventive protocols by controlling triglyceride- glucose index through proper medication.

MATERIAL AND METHODS:

The study was conducted at the Department of Cardiology, Punjab Institute of Cardiology, Lahore from June 5, 2020 to December 5, 2020. Informed consent was obtained from each patient. Their demographic information (name, age, gender, duration of coronary artery disease, smoking and diabetes) was also noted. Patients were followed for 1 month in OPD. The inclusion criteria was; patients of ages between 35-75 years of either gender with coronary artery disease. The exclusion criteria was; patients without angiographic evidence of coronary artery disease, patients with heart failure (left ventricular ejection fraction, LVEF < 45%), severe hepatic and/or renal insufficiency (creatinine >1.8mg/dl), thyroid dysfunction (TSH>5mIU), malignant disease (on medical record), BMI > 45 kg/m^2, suspected familial hypertriglyceridemia (triglyceride ≥500 mg/dl).

A sample size of 150 patients was determined using the following parameters: a confidence level of 95%, a margin of error of 6%, and the estimated percentage of cardiovascular events in patients having coronary artery disease, which was 16.7%.[12] Coronary artery disease defined as presence of >50% stenosis in one

or more epicardial coronary arteries detected on coronary angiography. Cardiovascular event was labeled if patient of coronary artery disease, who was on follow-up in OPD after 1 month, presents in emergency department with death primarily caused by acute myocardial infarction (chest pain, ST/T changes on ECG or troponin >100mIU), congestive heart failure (EF <30% on echocardiography), stroke (presence of paralysis, unconsciousness or aphasia and hypodense area on CT scan) or malignant arrhythmia (on ECG), myocardial infarctions that do not result in death, strokes, and the need for revascularization after discharge (PCI or CABG).

Triglyceride-glucose index was calculated by using formula: ln [fasting TG (mg/dL) × fasting plasma glucose (mg/dL)/^{2}] at time of presentation. Blood samples were taken in a 5cc disposable syringe under 8 hours fasting condition and was sent to the laboratory of the hospital for assessment of triglyceride and glucose level. Reports were assessed and triglyceride-glucose index was calculated (as per operational definition) in patients with and without cardiovascular event.

Statistical analysis using SPSS version 25.0 was performed on the data that was gathered. Quantitative variables like age, duration of coronary artery disease, triglyceride level, glucose level and triglyceride-glucose index were presented as Mean ± S.D. Qualitative variables like gender, diabetes, smoking and cardiovascular event were presented in form of frequency and percentage. Triglyceride-glucose index was compared in patients with or without cardiovascular event by using independent samples t-test. A p-value ≤0.05

was considered significant.

RESULTS:

Total 150 patients having coronary artery disease were selected for this study. Among these patients, 116(77.3%) were male, while 34(22.7%) were female. Mean age of the patients was 60.2±9.8 year. Majority of the patients 81(54.0%) had ages between 45-60 years, while 69(46.0%) patients were between 61-75 years of age group. The majority of patients 80(53.3%) had duration of diagnosis >1 year, while 70(46.7%) patients had duration of diagnosis ≤1 year. In this study, 83(55.3%) patients were diabetic and 78(52.0%) as smoker. (Table-1)

Patients with coronary artery disease had a frequency of 32 (21.3% overall) cardiovascular incidents. Patients who had a cardiovascular incident had a mean value of 9.48±0.52 for the triglyceride-glucose index and 8.75±0.56 in patients who did not have cardiovascular event. The level of triglyceride-glucose index was high in patients who had cardiovascular event than the patients without cardiovascular event when compared by using independent sample t-test the difference is significant (p=0.000001).

DISCUSSION:

It has been shown that even those who give the impression of being healthy have a risk of cardiovascular disease that is associated with their TyG index. However, further study has to be done in order to determine the predictive relevance of the TyG index in patients whose coronary artery disease is stable. The researchers came to the conclusion that the TyG index was considerably higher in patients who had cardiovascular events

Table-1: Frequency distribution of gender, age, duration of diagnosis and cardiovascular events.		Frequency	Percentage
Gender	Male	116	77.3
	Female	34	22.7
Age groups	45-60 years	81	54.0
	61-75 years	69	46.0
Duration of diagnosis	≤1 year	70	46.7
	>1 year	80	53.3
Cardiovascular events	Yes	32	21.3
	No	118	78.7

Table-2: Comparison of triglyceride-glucose index with and without cardiovascular events.					
Triglyceride-glucose index	Cardiovascular event	n	Mean	Std. Deviation	p-value
	Yes	32	9.48	0.52	0.000001
	No	118	8.75	0.56	

after reviewing the results of a nested case-control study, which they conducted. In addition to this, it was shown that the TyG index showed a positive association with the factors of cardiovascular risk, and that the top quartered group of this index's distribution had the lowest event-free survival rate. The objective of our study was to look for the connection that exists between high levels of triglycerides and high levels of glucose in people who had coronary artery disease and either did or did not experience a cardiovascular event throughout the course of our study.[13]

The results showed that the mean age of patients with cardiovascular event was 61.34±9.23 and in without cardiovascular event was 59.88±9.18. The overall mean age of patients in our study was 60.19±9.18. These results also matched with a study by Jin-JL et. al.[12] In this study, frequency of cardiovascular events in patients of coronary artery disease was 32(21.3%). The mean value of triglyceride-glucose index in patients of cardiovascular event was 9.48±0.52 and in patients of without cardiovascular event was 8.75±0.56.

The level of triglyceride-glucose index was high in patients of cardiovascular event than the patients of without cardiovascular event when compared by using independent sample t-test the difference is significant (p=0.000001). One study reported that among patients of coronary artery disease, cardiovascular event occurred in 16.7% in patients. In patients with cardiovascular event, the mean Triglyceride-glucose index was 8.91±0.66 while in patients without cardiovascular event, the mean Triglyceride-glucose index was 8.80±0.57. The difference was significant (p<0.05).[12]

At first, the TyG index was explored as a possible marker for detecting insulin resistance with a high degree of sensitivity and specificity. This was done so in order to establish a baseline for future research. The TyG index was demonstrated to be a strong predictor of both metabolic syndrome and type 2 diabetes, both of which contributed to cardiometabolic risk. Additionally, the TyG index was shown to be a good predictor of hypertension. After then, a number of investigations were carried out, each of which came to the conclusion that there was a connection between TyG index and CVD. Two of these investigations indicated that

a correlation exists between a high TyG index and the existence of cardiovascular risk factors.[14] Irace et al. conducted study on the link between atherosclerosis of the carotid artery and the TyG index using two distinct cohorts and found favorable and concordant results.[15] In addition, the TyG index was discovered to have a significant relationship with the occurrence of coronary calcification in a research study that was conducted in Korea and involved 4,319 persons.[16]

The predictive significance of the TyG index in CVD risk was not assessed in the aforementioned trials, however a research of 888 asymptomatic type 2 diabetes individuals demonstrated an association between a high TyG index and an increased risk of coronary stenosis.[17] Indeed, the association between the TyG index and cardiovascular events has been the subject of a small number of prospective researches. First, Vega et al. looked at whether or not the TyG index predicted cardiovascular disease mortality in a sample of 39,447 males and found that it did not.[18]

The precise mechanism that lies behind the connection between the TyG index and cardiovascular events has not been completely explored as of yet. TG and glucose are the two components that make up the formula for the TyG index. Even though the hypothesis that TG raises the risk of cardiovascular disease is still being discussed, a growing body of data demonstrates that TG and lipoproteins high in TG are variables that lead to cardiovascular disease.[19]

CONCLUSION:

The present study was the first to reveal that the TyG index was linked with future cardiovascular events in individuals who had stable coronary artery disease (CAD), despite the fact that earlier studies suggested a connection between TyG and the risk of cardiovascular disease. We came to the conclusion that the triglyceride-glucose index was significantly higher in patients who had cardiovascular event as compared to patients who did not have cardiovascular event. As a result of these findings, we strongly advise that patients undergo routine testing for their triglyceride-glucose index in order to forecast the likelihood of negative outcomes following coronary artery disease.

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