Original Article

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Correlation of Triglycerides to Glucose Index with the SYNTAX Score in Patients of Acute Coronary Syndrome

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Author`s Contribution

[1,2]Substantial contributions to the conception or design of the work; or the acquisition, [3,5]Drafting the work or revising it critically for important intellectual content
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ABSTRACT

Objective: To determine the severity of triglycerides to glucose index and its correlation with the SYNTAX score in patients presenting with ACS.

Methodology: An analytical type of cross-sectional study was done in the Department of Cardiology CPEIC, Multan. 200 patients with ACS were enrolled, their fasting triglycerides and glucose were sent, and all underwent coronary angiography during hospitalization. The Triglycerides-Glucose index was calculated, and after descriptive statistics, the proportion of ≥8.8 TyG was determined. Following it, the correlation of TyG with the syntax score was measured and a p-value of ≤ 0.05 was found significant. Effect modifiers were controlled by data stratification.

Results: There were 162 (81.0%) male, mean age 46.52±14.41 years and mean BMI was 24.43±4.07 kg/m2. 119 (59.5%) patients had severe ≥8.8 TyG, mean SYNTAX score I was 24.01±2.29, and mean TyG index was 8.71±0.92.A significant positive correlation between the Syntax score and TyG index, (r: 0.924, p<0.001). After data stratification correlation was high and significant in males, age group of 51-65 years, BMI from 25 to 29.9 kg/m2, smokers, hypertensives, and diabetic patients

Conclusion: Triglyceride Glucose Index is positively correlated with syntax score. TyG being an inexpensive and quick tool can be used as the coronary artery disease severity predictor.

Key Words: Triglycerides to Glucose index, TyG Index, Coronary Artery Disease, Severity, Syntax Score, Acute Coronary Syndrome.

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Introduction

Worldwide, cardiovascular diseases (CVD) account for a disproportionate share of deaths and hospitalizations.[1] Nearly 25% of the world's population is South Asian, however, they have 50% of the world's cardiovascular fatalities.[2] Countries of low or medium income, including those in South Asia, account for more than three-quarters of all fatalities from cardiovascular disease.[3] Among South Asians, diabetes is a significant risk factor, with 23% of the risk compared to 8% among Europeans, according to previous studies.[4] An exponentially increasing epidemic of childhood obesity is projected to affect 45 million children in South and Southeast Asia who are 5 years old by 2030, according to research. Metabolic syndrome, which includes diabetes, prediabetes, hypertension, and obesity, is making coronary artery disease more common.[5]

Insulin resistance (IR) is a metabolic syndrome hallmark, brought on by oxidative stress and a pro-inflammatory state, both of which contribute to heightened cellular dysfunction[6]. Although it is a challenging and costly procedure, the best way to assess insulin's effect is a "hyper-insulinemic-euglycemic clamp" in living organisms.[7] HOMA-IR, a Homeostasis model evaluation for IR is the most used technique for measuring insulin sensitivity, but again complex[8]. In addition, metabolic scores for insulin resistance (METS-IR), triglycerides HDL ratio, and triglycerides glucose index (TyG index)

have been studied as non-insulin IR indicators. [9] Previous studies have demonstrated that the TyG index is a straightforward and dependable indicator for evaluating the degree of coronary artery disease (CAD). [10]

Our knowledge of the Ty-Glu index's relationship with CAD needs to be expanded globally. Since obesity and insulin resistance are becoming more frequent, it's crucial to find cost-effective approaches to define coronary artery disease severity by insulin resistance. Given the financial hardship, the Ty-Glu index evaluation can be a beneficial, low-cost, and time-efficient tool for our community. Therefore, the purpose of this study was to assess the correlation between the TyG index and the degree of coronary artery disease in ACS patients using the SYNTAX score.

Methodology

After the approval of the Institutional Ethical Review Committee (IERB# 022/CPEIC, dated 03/08/2023), a cross-sectional analytical study was carried out in the Cardiology Department of Choudhary Pervaiz Elahi Institute of Cardiology, Multan, from August 15th, 2023 to February 15th, 2024. The sample size was calculated using the proportion of severity of the TyG (Index ≥8.8= 49.4%,[11] with a confidence limit of 7%), 196, and a non-probability convenient sampling technique was used. Patients with acute coronary syndromes, 18-65 years old, and of both sexes, were included in the study after receiving informed permission. Exclusion criteria for participation in the trial included a recent angiography or CABG, a diagnosis of hyperlipidemia, or the use of lipid-lowering medications within the past seven days.

After informed consent, the patients presenting with ACS (Unstable angina, NSTEMI, and STEMI) after thorough history and examination were admitted and the blood samples were taken after a minimum of eight hours of fasting. and sent for glucose and lipid profiles. Based on the literature review, the TyG index was calculated using the formula: ln[(Tri×Glu, both in mg/dL) /2], and a ratio of ≥8.8 was taken as severe[11]. The patients underwent angiography during index hospitalization (for unstable angina and NSTEMI). Syntax-I score was calculated using an online calculator.[12]

Data was analyzed using SPSS v.26. The normality of data was assessed by using skewness of data. Qualitative variables like gender, diabetes, hypertension, obesity, and smoking were measured in terms of frequency and percentages. Quantitative variables like the cholesterol, HDL-c, LDL-c levels, TyG index, and the Syntax score I, were described in terms of mean and standard deviation. the correlation of the TyG index with the SYNTAX score was determined using person correlation for normal data and speamen rank correlation for non-normal data.

Results

Overall, 200 cases with acute coronary syndromes were enrolled in this study. There were more males than females, 162 (81.0%) and 38 (19.0%), respectively. The mean age was 46.5±14.4 years. Most of the patients 102 (51.0%) were between 51-65 years. The mean BMI was 24.4±4.1 Kg/m^2. Obesity was noted in 110 (55.0%) patients. Diagnosis, Killip, smoking status, hypertension, diabetes status, stroke status, and dyslipidemia status were shown in the Table I.

Table I: Demographic profile of study population. (n=200)

Variables	Presence
Males	162 (81.0%)
Females	38 (19.0%)
Age (years)	46.52±14.41
Age group (18-30 years)	42 (21.0%)
Age group (31-50 years)	56 (28.0%)
Age group (51-65 years)	102 (51.0%)
BMI (kg/m^2)	24.43±4.07
<18.5 kg/m^2 BMI	31 (15.5%)
18.5 - 24.9 kg/m^2 BMI	59 (29.5%)
25 – 29.9 kg/m^2 BMI	110 (55.0%)
Smoking Status	41 (20.5%)
Hypertension Status	86 (43.0%)
Diabetes status	38 (19.0%)

Out of 200 patients, 119 (59.5%) patients had severe ≥8.8 TyG and 81 (40.5%) had non-severe <8.8 TyG. The mean coronary artery severity with SYNTAX score I and triglycerides index was 24.01±2.29 and 8.71±0.92, respectively. The Pearson Correlation between coronary artery severity with the TyG index was 0.924 and this correlation was statistically significant, ($p<0.05$). (Figure. I). (Table. II).

Table II: Syntax Score and TyG index Correlation.

	Mean ± S.D	Pearson correlation	p-value
SYNTAX I score	24.01 ± 2.29	0.924	<**0.001**
TyG Index	8.71 ± 0.92		

Pearson Correlation Syntax score with the TyG index after data stratification is shown in the Table. III. It was seen that correlation was high and significant in males, age group 51-65 years, BMI 25–29.9 kg/m^2, smokers, hypertensives, and diabetic patients ($p<0.05$). (Table III).

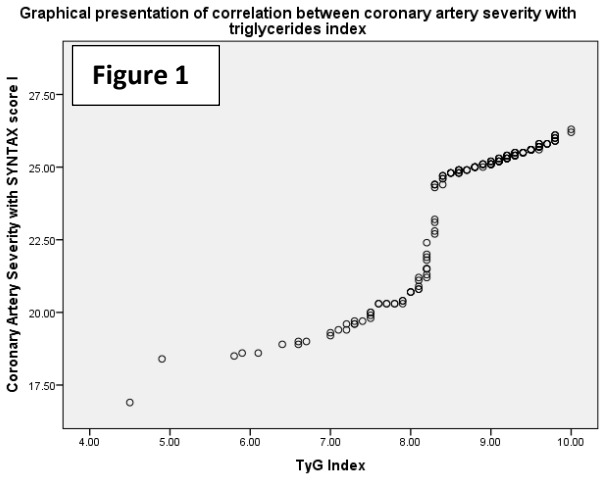

Table III: Syntax Score and TyG index Correlation after data stratification.

	Variable	Pearson correlation	p-value
Gender	Male	0.921	<0.001
	Female	0.241	0.632
Age Groups (years)	18-30	0.352	0.415
	31-50	0.485	0.805
	51-65	0.916	<0.001
BMI Groups (kg/m^2)	<18.5	0.021	0.715
	18.5 - 24.9	0.524	0.638
	25 – 29.9	0.911	<0.001
	Smoking Status	0.925	<0.001
	Hypertension Status	0.924	<0.001
	Diabetes status	0.939	<0.001

Discussion

Samanta LE et al. devised and validated the TyG index in an adult Mexican sample. [13] In certain instances, this measure has outperformed HOMA-IR as a diagnostic tool for IR.[14] Diabetes mellitus, hypertension, polycystic ovarian syndrome, cancer, chronic kidney disease, and neurological problems are all associated with insulin resistance (IR), a metabolic abnormality. The TyG index has applications beyond cardiac illness due to the need for early detection and thorough screening of at-risk individuals.[15] Sánchez-Íñigo et al. found that the TyG index was a strong predictor for the Framingham model and was substantially linked to an increased risk of developing CVD. [16] On the other hand, a different study showed that the TyG index, albeit being a metabolic disease marker, could only predict diabetes and not cardiovascular illnesses. [17]

The first objective was to determine the severity of triglycerides to glucose index which came out as a mean level was 8.71 ± 0.92 and a proportion of TyG index ≥8.8 was noted in 40.5% of patients. When the literature was evaluated, it was consistent with previous studies, mainly studies depicting its range from 8-9 as mean values and proportion from 40-50%. [18-19] Similarly the severity index marker as Syntax score showed a mean of 24.01 ± 2.29, which again shows the more severe nature of coronary artery disease in our population. A study done in Mayo Hospital Lahore on ACS patients depicted a mean SYNTAX score was 28. 69+4.86 [20], while another study done in Lady Reading Hospital showed more than 33% of patients had a syntax score of >22. [21]

Our study showed a strong correlation of the TyG index with the severity of coronary heart disease. TyG and glycemia are the traditional cardiometabolic risk factors. Changes in these variables are closely linked to CVD, atherosclerosis, and IR. The few studies on the TyG index with CVD and the factors that may impact it are troubling. Individuals whose TyG index was in the upper two deciles were more likely to have coronary calcification and arterial stiffness, according to the research.[22,23] Additionally, research has connected high TyG index readings to hypertension, type 2 diabetes, cardiovascular disease (CVD), subtypes of CVD including stroke, and outcomes associated with atheromatous plaques. [18]

There are a few caveats to our study. No follow-up was conducted as it was an observational research involving only one center. Additional research including our population's long-term MACEs and the impact of TyG on the severity of coronary artery disease as measured serially over time is needed.

Conclusion

A favorable correlation was found between the SYNTAX score and triglyceride glucose index. Due to its low cost and short processing time, TyG has diagnostic utility in assessing the severity of coronary arteries in ACS patients and is a predictor of coronary severity.

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