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Exploring the Triglyceride–Glucose Index: A New Biomarker for Cardiovascular Risk Prediction

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ABSTRACT

Objective: Triglyceride glucose index is used as reliable, accessible surrogate marker for cardiovascular disease and insulin resistance. We examined the association between TyG index and cardiovascular events.

Methods: We enrolled 120 patients based on inclusion and exclusion criteria and we have calculated the TyG index and patients were grouped according to their index into low, intermediate, high. The end point was the incidence of cardiovascular event or events.

Results: The median follow-up of 90 days has been conducted. Out of 120 patients from the study. The rates of cardiovascular risk were 16%, 33% and 50% in patients with low, intermediate and high Triglyceride glucose index. The level of severity of cardiovascular risk events was most commonly seen in high level i.e 50%. Higher Triglyceride glucose index score significantly predicted a major risk. The most common age group which is suspected to CAD was 35-45years.

Conclusion: Based on our current study evidence a higher TyG index has significant relationship with the incidence of cardiovascular events. Our results indicate a fair predictive ability of the TyG index to assess cardiovascular risk in 10 years, considering the cut off value of 9.04 for the TyG index. Thus, the use of the TyG index for cardiovascular risk screening seems promising to early identification for high risk for cardiovascular events in clinical and public health practice

Key words: Percutaneous coronary intervention (PCI), coronary artery bypass graft (CABG), coronary artery disease(CAD), Cortriatriatumsinistrum / CT-scan(CTs)

INTRODUCTION

Coronary artery disease (CAD) is one of the leading causes of morbidity and mortality in world-wide. It happens when the accumulation of atherosclerotic plaque narrows or blocks the coronary arteries, which provide the heart muscle with oxygen-rich blood. Calcium, fatty materials, cholesterol and other cellular waste make up these plaques. This process is called as atherosclerosis, causes the myocardium blood supply to become restricted over time, resulting in symptoms like angina, dyspnoea, or in extreme situations heart attack. Numerous health factors that people can change (including smoking) alongside diabetes mellitus, obesity, hypertension, hyperlipidemia and physical inactivity together with the non-modifiable variables age, gender and ancestry contribute to Coronary Artery Disease. All pathophysiological factors of CAD demonstrate intricate interactions between inflammation, thrombosis, lipid metabolism and endothelial dysfunction[1].

The diagnosis process and risk evaluation of patients have become more efficient thanks to the developments in stress testing technology alongside both cardiac CTs and coronary angiography. Patients receive treatment with pharmacological drugs including statins and beta-blockers and antiplatelet medicines while healthcare providers also advise lifestyle modifications with interventional procedures that include CABG and PCI. To achieve successful

preventive and treatment solutions for reducing global CAD health burden one must understand the nature of the condition[2].

METHODOLOGY

A six months prospective observational study is planned at Malla Reddy Narayana Multi- speciality Hospital, spanning from October 2024 to March 2025. The study involved 120 participants recruited from both inpatient and outpatient departments. Key investigations will include lipid profile assessment and blood glucose measurements (fasting and random). Patients will be monitored over time to evaluate their clinical progression and health outcomes.

Inclusion Criteria:
Age above 18 years
The availability of triglyceride and glucose measurements
No history of CVD
Presence of co-morbid conditions (Hypertension, diabetes mellitus and hyperlipidemia)

Exclusion Criteria:
Age below 18 years
History of chronic heart failure
History of malignancies
Use of medications affecting lipid or glucose metabolism
Pregnant women and lactating mothers

RESULTS

BASED ON AGE: The research involves 120 patients of varying ages. Among them 10 patients were between 25-35 years old, 35 patients were between 35-45 years old, 31 patients were between 45-55 years old, 25 patients were between 55-65 years old, 19 patients were between 65-75 years old had a higher likelihood of being affected.

Table 1: the study findings revealed the predominant age group susceptible to CAD

AGE	FREQUENCY	PERCENTAGE
25-35	10	8.3%
35-45	35	29.1%
45-55	31	25.8%
55-65	25	20.8%
65-75	19	15.8%

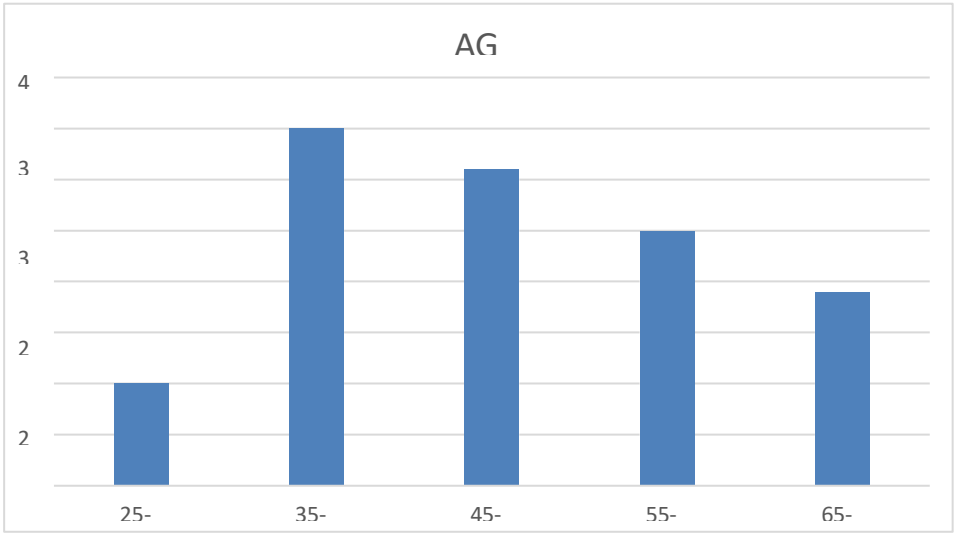

Figure 1: The graph indicates the predominant age group prone to CAD

Based On Severity:

This study demonstrates the division within a sample of 120 people. Based on triglyceride glucose index, the evaluated data is classified as low, intermediate and high scores.

Table 2: Assessment of TyG index based on their severity

DESCRIPTION	NO.OF SAMPLES	PERCENTAGE
Low	20	16%
Intermediate	40	33%
High	60	50%

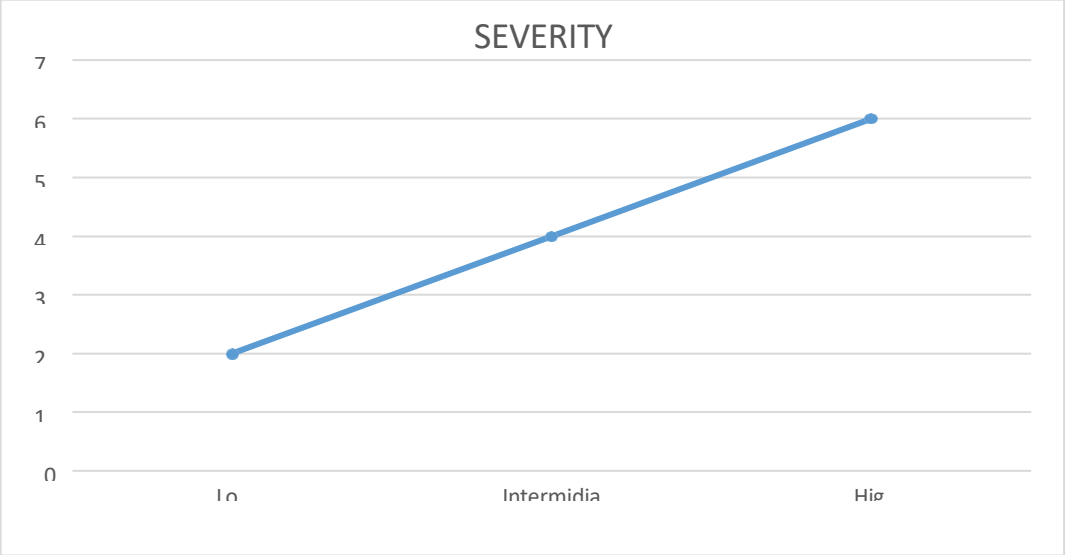

Figure 2: The graph depicts the severity of TyG index in the individuals prone to CAD

Based On Gender: Among the 120 samples, 75 individuals are male and 45 individuals are female.

Table 3: Assessment of TyG based on gender (male, female)

GENDER	FREQUENCY	PERCENTAGE
Male	75	62.5%
Female	45	37.5%

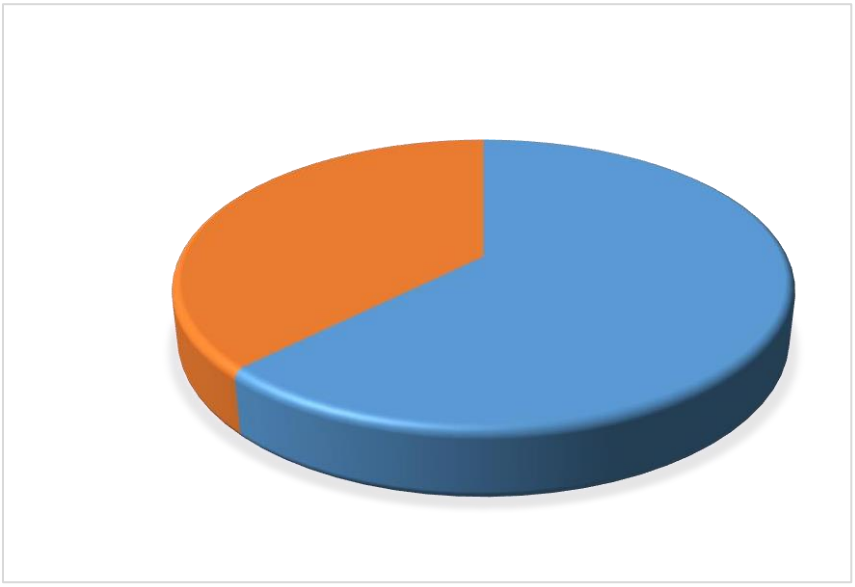

Figure 3: The graph depicts the assessment of TyG based on gende

Estimation with life style factors:

The positive association of smoking, alcohol, with physical activity and without physical activity suggest all these factors contribute to increasing the TyG index, indicating elevated insulin resistance and poorer metabolic health.

Table 4: estimation of life style factors with TyG index

Life-style Factors	Frequency	Percentage
Smoking	30	25%
Alcohol	50	41.6%
Physical activity (with)	10	8.3%
Physical activity (without)	30	25%

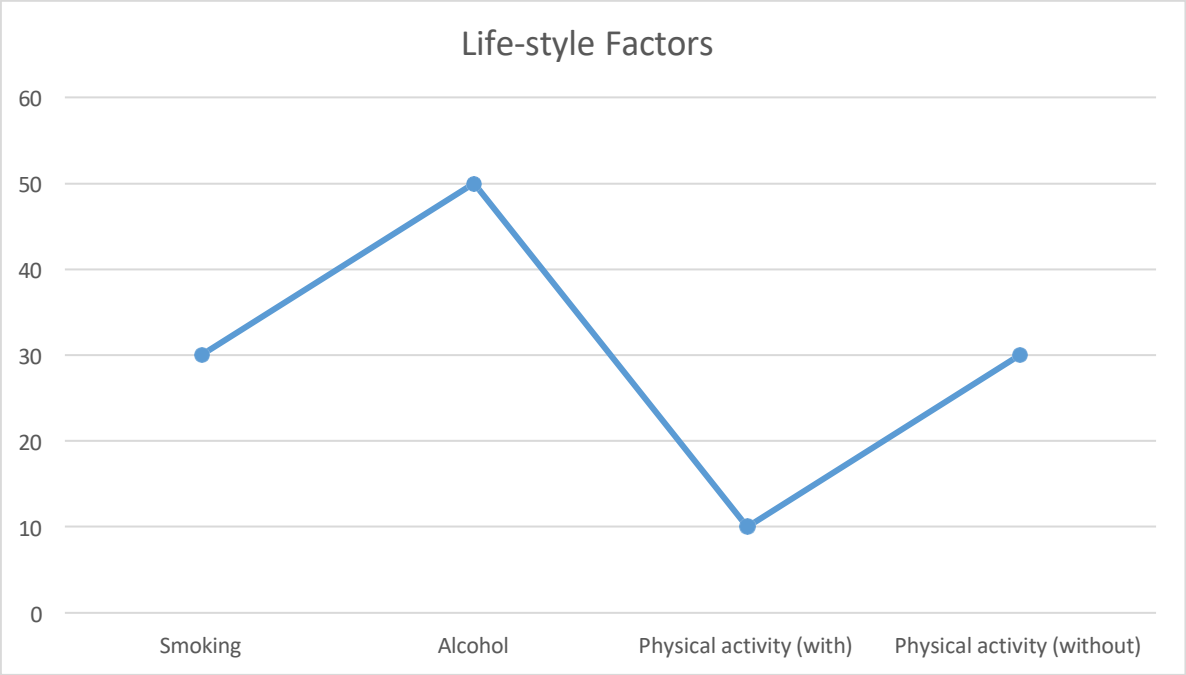

Fig 4: the graph depicts the estimation of life style factors with TyG index

BASED ON STANDARD DEVIATION

Table 5: estimation of standard deviation based on TyG index

Characteristic	Variance(s^2)	Count (n)	Mean($\bar{x}$)	SS	Standard Deviation
Low TyG index	0.061	20	7.675	1.1775	0.248
Intermediate TyG index	0.031	60	9.375	1.8725	0.178
High TyG index	0.024	40	8.73	0.964	0.157
Total	0.656	120	8.854	52.120	0.656

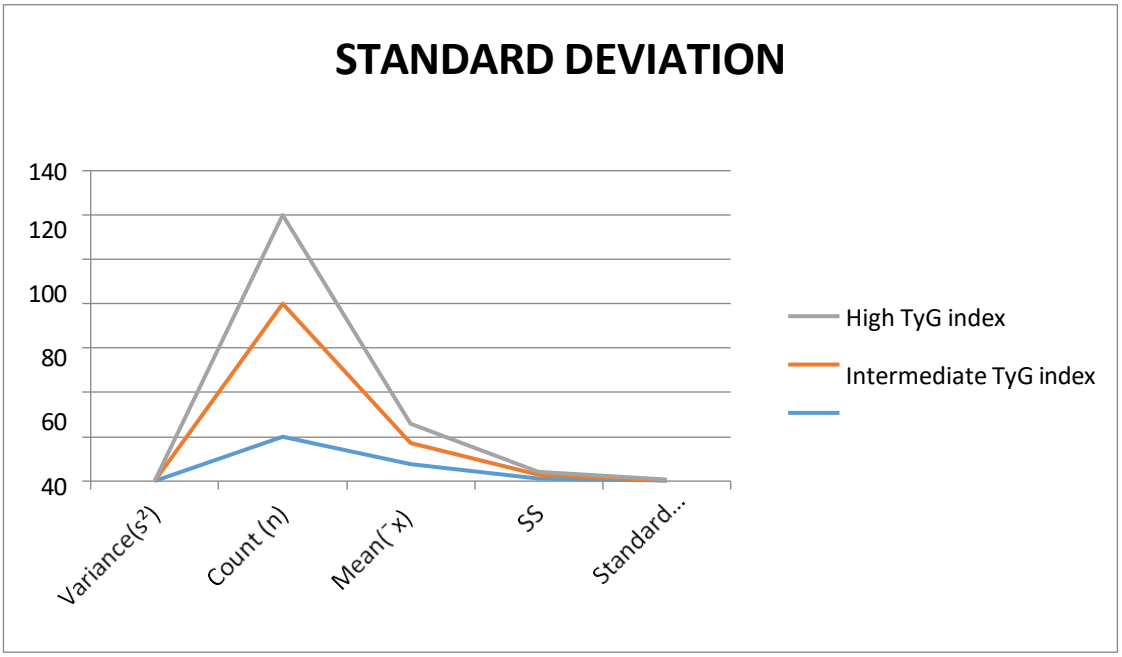

Fig 5: The graph depicts the standard deviation between the groups

DISCUSSION

Cardiovascular disease (CVD) remains one of the major causes of death in worldwide, owing primarily to modifiable metabolic risk factors. Early detection of persons at high risk is crucial for prompt intervention and successful preventative efforts. In this context, the Triglyceride-glucose (TyG) index is recognized as an optimistic, novel biomarker for assessing CVD risk, owing to its close relationship with insulin resistance (IR), a key process in the onset of atherosclerosis and other CVD complications[3].The TyG index serves as an efficient and simple surrogate marker for insulin resistance by measuring fasting triglyceride and glucose levels. The clinical practice commonly measures elevated triglyceride and glucose levels. The TyG index serves as an affordable non-invasive tool for early risk assessment particularly in primary care and resource-constrained environments. Research demonstrates that the TyG index shows strong agreement with advanced insulin resistance assessments which use the hyperinsulinemic-euglycemicclamp method[4].

Metabolic syndrome contains insulin resistance as its main component while also including abdominal obesity and hypertension and dyslipidaemia and hyperglycemia which are established CVD risk factors. The combination of triglyceride levels from dyslipidaemia with glucose tests from glycemia state displays metabolic dysfunction which causes cardiovascular risks through the TyG index. Research proves that assessing the TyG index successfully forecast future type 2 diabetes diagnoses along with early-stage cardiovascular events leading toward coronary artery disease (CAD) and myocardial infarction and stroke[5].

The TyG index delivers forecasting abilities within different patient cohorts composed of diabetic patients and those who do not have the condition. An elevated TyG index aids healthcare providers to identify type 2 diabetes patients showing insulin resistance for cardiovascular risk evaluation. The TyG index provides medical practitioners with a diagnostic system to identify people among apparently healthy individuals who need either lifestyle intervention or intensified biomedical care before disease development[6]. The TyG index demonstrates value for improving current clinical screening processes. Healthcare providers need to refer patients with high TyG index results to participate in intensified risk management programs that include dietary interventions with physical exercise programs and lipid-reducing drugs and glycemic control treatments. The TyG index functions as an assessment procedure for medical diagnosis and provides doctors with a way to monitor treatment outcomes at different stages of patient care[7].

CONCLUSION

In conclusion, the triglyceride-glucose index stands out as a unique, practical, and clinically meaningful marker for measuring cardiovascular disease risk. By reflecting the combined impact of dyslipidaemia and hyperglycemia, it provides insight into the metabolic abnormalities that precede cardiovascular disease. Its substantial link to insulin resistance and prognostic value for cardiovascular events justify its expanding importance in preventive cardiology. While more standardization and validation are required, the TyG index has significant potential as a broadly applicable

tool for early diagnosis and treatment of cardiovascular disease risk.

A growing body of evidence supports the TyG index as a strong predictor of insulin resistance and its associated complications. Numerous studies have demonstrated its correlation with metabolic abnormalities, including visceral adiposity, hypertension, atherogenic dyslipidaemia, and impaired glucose tolerance. Furthermore the TyG index has shown promise as an early indicator of cardiovascular risk. This highlights its utility not only as a diagnostic marker but also as a preventive tool that may guide lifestyle modifications and therapeutic strategies at an early stage.

Conflict of interest
The authors declare that they have no conflict of interest.

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