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Original Research Paper

Neurology

AN OBSERVATIONAL STUDY OF TRIGLYCERIDE GLUCOSE INDEX AS A PROGNOSTIC MARKER IN ELDERLY HYPERTENSIVE PATIENTS WITH ACUTE ISCHEMIC STROKE IN TERITIARY CARE CENTRE

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ABSTRACT

Introduction: A primary cause of morbidity and death is ischemic stroke,especially within elderly hypertensive patients. Insulinresistance,risk factor, is linked to cerebrovascular events. The triglyceride-glucoseindex (TyG) be a reliable marker for Insulin resistance, linked to metabolic disorders like diabetes and cardiovascular diseases. However, its prognostic significance in elderly hypertensive patients with acute ischemic stroke remains underexplored. **Materials and Methods:** The present prospective observational study took place on 64 patients in the department of general medicine, RL Jalappa Hospital and Research Centre, Kolar, temporarily of 18 months from july 2022 to december 2023. Prior to the initiation of the study, Ethical and Research Committee clearance was obtained from Institutional Ethical Committee. **Results and Observations:** The study analyzed the prevalence of hypertensives among individuals aged 71- 80 years, with a majority of subjects being males (54.69%), predominantly from urban areas (64.06%), predominantly Hindus (30.06%), Muslims (32.81%), Christians (21.87%), and other religions (6.25%). The majority of subjects were of high socioeconomic status (54.69%), with a history of hypertension (100 %) and no medical history (4.6%). The fasting triglyceride levels were 167.5±15.1 mg/d, and the triglyceride glucose index was 8.9±0.6. The study found significant differences in blood pressure, stroke recurrence, poor functional outcome, neurological worsening, and mortality rates among the groups based on the triglyceride glucose index. The Incidence of Stroke recurrence was high in group IV, poor functional outcome was high in group III, neurological worsening was high in group IV, and mortality was high in group IV. **Conclusion:** The Ty GLUCOSE index, a risk factor for stroke mortality and recurrence, is linked to higher risk in Hypertensive patients. However, neither TG index nor HOMA-IR can accurately predict stroke death or recurrence in nondiabetic acute ischemic stroke patients. The TyG index may be useful for assessing risk in the broader community. High TG index correlates with unfavorable consequences after a stroke, including increased mortality and stroke recurrence. The TG index's linearity suggests it could improve ischemic stroke risk classification for the general population.

KEYWORDS : Stroke, Triglyceride Glucose Index, Stroke Reoccurencce, Insulin Resistance, Mortality, Diabetes.

INTRODUCTION

Ischemic stroke remains a significant source of morbidity and mortality, particularly in the elderly population with underlying hypertension.Among the various risk factors associated with ischemic stroke, insulin resistance has garnered increasing attention due to its potential role in the pathogenesis and prognosis of cerebrovascular events. The triglyceride-glucose Index (TyG index), inferred from Fasting Triglyceride and Glucose levels, has emerged as a reliable surrogate marker for Insulin Resistance. Elevated TyG index has been implicated in the development and progression of various metabolic disorders, including diabetes mellitus and cardiovascular diseases. However, its prognostic significance in elderly hypertensive patients with acute ischemic stroke remains underexplored.

This observational study aims over investigate the prognostic value of the TyGlucose Index in elderly hypertensive Patients presenting with acute ischemic stroke. By examining the association between TyG index levels and clinical outcomes, including stroke severity, functional disability, and mortality rates, we seek to elucidate the Character of insulin resistance in shaping the trajectory of Ischemic stroke in this high- risk population. This study endeavors to contribute to the growing body of evidence on the utility of TyG index as a prognostic marker in ischemic stroke.

AIMS AND OBJECTIVES

AIM:

The present Study have existance toinvestigate the prognostic value of the Triglyceride
GLucoseindex in elderly hypertensive Patients presenting with Acute Ischemic stroke at a tertiary care center.

OBJECTIVES:

The following were the objectives of present study:

- To estimate fasting triglyceride glucose levels in elderly hypertensive patient with ischemic stroke.
- To estimate fasting glucose-index in elderly hypertensive patient with Acuteischemic stroke
- To calculate-triglyceride glucoseindex in elderly hypertensive patient with Acute ischemic stroke.

MATERIALS AND METHODS

Place of Study: The present study was carried out in the department of general medicine, RL Jalappa Hospital and Research Centre, Kolar

Type of Study: The present study was prospective observational study.

Duration of Study: The study was carried out for a session of 18months, from July 2022 to December 2023.

Sample Size

- The study keeps conducted on 64 patients.
- The sample size was calculated by using the formula:

$$n = \frac{z^2_{1-\alpha/2}\sigma^2}{d^2}$$

where,
s is the Standard deviation d is the Precision
1- α/2 is the Desired Confidence level.

Yimo Zhou et al. reported the median TyG index to be 8.73 (IQR, 8.33–9.21). We computed SD from IQR assuming normal distribution of the values using the formula SD= IQR/1.35.
SD=0.65

Assuming the expectedpopulation standarddeviation to be 0.65 for Triglyceride-Glucose Index, and employing t-distribution to estimate sample size, the study required a sample size of 64 subjects to estimate a mean with 95% confidence and a precision of 0.16.

Inclusion Criteria:

- Patients meeting the following criteria were enrolled into the study.

- Patients aging more than 60 years.
- Patients who were known cases of hypertension and on treatment..
- Patients newly diagnosedwith ischemic stroke.
- Patients willing to give consent.Patients willing to participate.

Exclusion Criteria

- Patients meeting the following criteria were excluded from the study.
- Patientswho were known cases of type 2 diabetes mellitus or on glucose lowering drugs.
- Patients on lipoprotein lowering drugs(statins).
- Patients with haemorrhagic stroke.Patients with embolic stroke.
- Patients who were not willing to give consent.
- Patients not willing to participate.

Data Collection

- A detailed clinical history and physical examination was carried out on patients followed by a thorough review of their hospital records.
- All the patients meeting inclusion criteria were included in the study.
- Data on Blood pressure, Triglyceride levels, FBS levels, NCCT/MRI BRAIN and ECGwas collected.
- The Triglyceride Glucose Index, derived as Ln[fasting triglyceride (mg/dL) × fasting glucose (mg/dL)/2], is the logarithmized product of Triglycerides and Glucose.
- These values are recorded and noted down in the master charts.
- All the data was documented and analyzed by subjecting to statistical analysis.

Statistical Analysis

The collected data was entered into Microsoft Excel Worksheet-2010 and data was taken into IBM SPSS Statistic for windows, version 24 (IBM Corp., Armonk, N.Y., USA) software for calculation of frequency, percentage, mean, standard deviation and probability value.

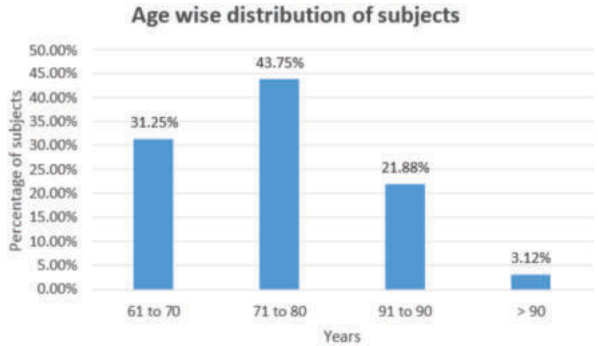
Qualitative data was represented in the form of frequency and percentage.

- o Association between qualitative variables was assessed by Chi Square test with continuity correction for 2 x 2 tables and
- o Fisher's exact test for all 2 x 2 tables, where P value of chi square test was not valid due to small counts.

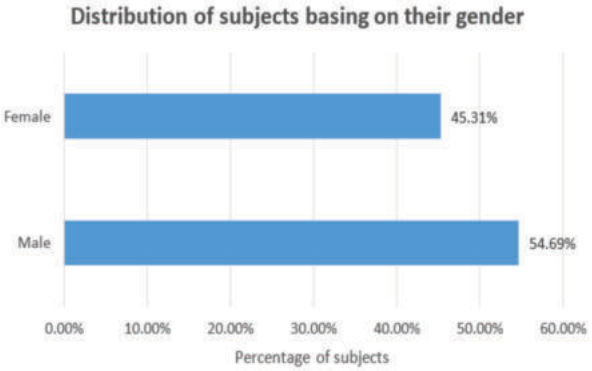
Quantitative data was represented using mean and standard deviation.

- o Analysis of quantitative data within the groups was done using paired t test if data passes 'Normality test'.
- o Analysis Of Varience (ANOVA) was used to compare more than two groups.
- * A 'P' value of <0.05 was considered statistically significant.

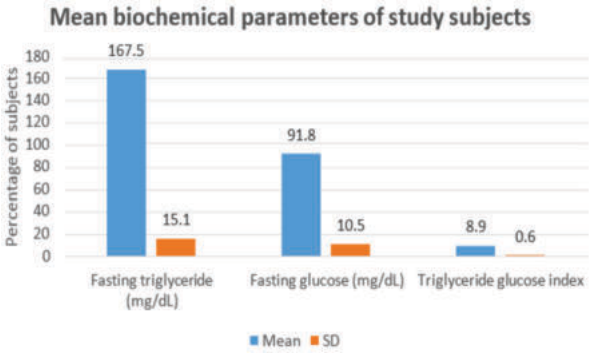
RESULTS



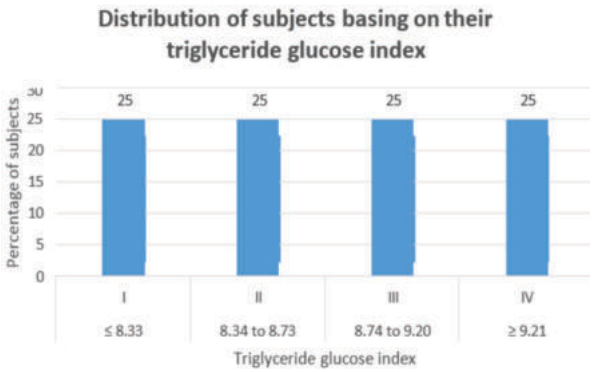
Majority of subjects were in age group of 71 to 80 years i.e. 28 (43.75%) subjects followed by 20 (31.25%) subjects in age group of 61 to 70 years, 14 (21.88%) Subjects in age group of 81 to 90years and finally 2 (3.12%) subjects of age >90 years.



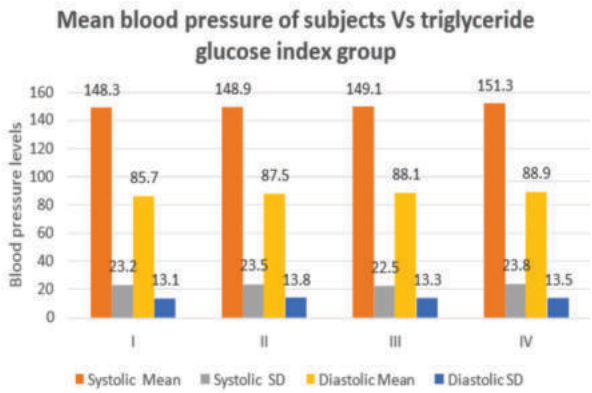
Majority of subjects were males i.e., 35 (54.69 %) followed by 29 (45.31 %) females.



The fasting triglyceride levels were 167.5±15.1 mg/dL, fasting glucose levels were 91.8±10.5 mg/dL and triglyceride glucose index were 8.9±0.6.



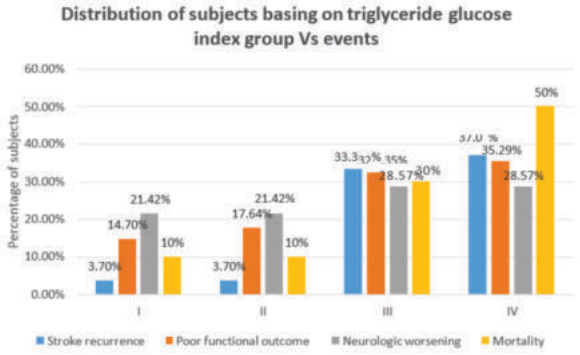
Based on triglyceride glucose index, there were 16 (25%) subjects belonging to Group I, 16 (25%) subjects belonging to Group II, 16 (25%) subjects belonging to Group III, 16 (25%) subjects belonging to Group IV.



essure of subjects Vs triglyceride glucose index group.

The mean systolic blood pressure in group I subjects was148.3 ± 23.2 mmHg, in group II was 148.9 ± 23.5 mmHg, in group III was 149.1 ± 22.5 mmHg and that in group IV subjects was 151.3 ± 23.8 mmHg. The p-value calculated was 0.0001 indicating a very high statistical difference between groups in terms of systolic blood pressure of subjects and TRIGYCERIDE GLUCOSE INDEX group. Systolic pressure was high in Group IV.

The mean diastolic blood pressure in group I subjects was85.7 ± 13.1 mmHg, in group II was 87.5 ± 13.8 mmHg, in group III was 88.1 ± 13.3 mmHg and that in group IV subjects was 88.9 ± 13.5 mmHg. The p-value calculated was 0.0001 indicating a very high statistical difference between groups in terms of diastolic blood pressure of subjects and TRIGYCERIDE GLUCOSEINDEX group. Diastolic pressure was high in Group IV.



Out of 27 subjects with stroke recurrence, majority were in group IV, i.e., 10 subjects (37.03 %); followed by 9 subjects (33.33 %) group III; 1 subject (3.70 %) group I and II respectively. The p-value calculated was 0.0001 indicating a highly significant statistical difference among the TRIGLYCERIDE GLUCOSEINDEXgroups in terms of Stroke recurrence. The incidence was high in group IV (i.e., TRIGLYCERIDE GLUCOSE INDEX≥ 9.21).

Out of 34 subjects with poor functional outcome, majority were in group IV, i.e., 12 (35.29 %) subjects; followed by 11 (32.35 %) subjects in group III; 6 (17.64 %) subjects in group II and 5 (14.70 %) subjects in group II. The p-value calculated was 0.0001 indicating a highly significant statistical difference between theTriglyceride Glucose Index groups in terms of poor functional outcome. The incidence was high in group IV (i.e.,Triglyceride Glucose Index≥ 9.21).

Out of 28 subjects with neurological worsening, majority were in group III and IV, i.e., 8 (28.57 %) subjects respectively; followed by 6 (21.42 %) subjects in group I and II respectively. The p-value calculated was 0.0001 indicating a highly significant statistical difference between the Triglyceride Glucose Index groups in terms of neurological worsening. The incidence was high in group IV (i.e., Triglyceride Glucose Indexof Group III: 8.74 to 9.20 Triglyceride Glucose Indexof Group IV ≥ 9.21).

Out of 10 subjects with mortality, majority were in group IV, i.e., 5 (50 %) subjects; followed by 3 (30 %) subjects group III; 1 (10 %) subject group I and II respectively. The p-value calculated was 0.0001 indicating a highly significant statistical difference between the Triglyceride Glucose Index groups in terms of mortality. The incidence was high in group IV (i.e., Triglyceride Glucose Index ≥ 9.21).

Summary

- Majority of "SUbjects were in Age Group of 71 to 80 years i".e. 43.75% subjects followed by 31.25% subjects in age group of 61 to 70 years, 21.88% Subjects in Age group of 81 to 90years and finally 3.12% subjects of age >90 years.
- Majority of subjects were males i.e., 54.69 % subjects followed by 45.31 % female subjects.
- Majority of subjects reside in urban areas i.e. 64.06% subjects followed by 35.94% subjects residing in rural area.
- Majority of subjects were Hindus i.e. 39.06% subjects followed by 32.81 % subjects were Muslims, 21.87% subjects were Christian and 6.25% subjects belonged to other religions.
- Majority of subjects were with high socioeconomic status i.e. 54.69% subjects followed by 19 29.69% subjects with low socioeconomic status and 15.62% subjects followed by middle socioeconomic status.
- Majority of subjects had history of hypertension, i.e. 100 % subjects followed by 20.3% subjects with atrial fibrillation.
- The fasting triglyceride levels were 167.5 ±15.1 mg/d, fasting glucose levels were 91.8 ±10.5 mg/dL and triglyceride glucose index were 8.9 ±0.6.
- Based on triglyceride glucose index, there were 25% subjects belonging to Group I, 25% subjects belonging to Group II, 25% subjects belonging to Group III, 25% subjects belonging to Group IV.
- it has a very high statistical Difference between groups in terms of blood pressure of subjects and Triglyceride Glucose Index group. Both systolic and diastolic pressure was high in Group IV.
- There was a highly Significant Statistical difference among the Triglyceride Glucose Index groups in terms of stroke recurrence. The incidence was high in group IV (i.e., Triglyceride Glucose Index ≥ 9.21).
- Regarding poor functional result, there was a statistically significant variance between the groups based on the triglyceride glucose index. The incidence was high in group IV (i.e.,Triglyceride Glucose Index ≥ 9.21).
- Considering neurological deterioration, there was a statistically significant distinction between the Triglyceride Glucose Index groups.. The incidence was high in group IV (i.e., Triglyceride Glucose Index of Group III: 8.74 to 9.20 Triglyceride Glucose Indexof Group IV ≥ 9.21).
- In terms of mortality, there was a profound statistical disparity between the groups based on the triglyceride Glucose index.. The incidence was high in group IV (i.e., Triglyceride Glucose Index ≥ 9.21).

CONCLUSION

An elevated TG index has been linked to a Greater the risk of stroke death and recurrence in hypertensive patient. However, in nondiabetic acute ischemic stroke patients, neither TG index nor HOMA- IR can be a reliable indicator of stroke death or recurrence. The TyGLUCOSE Index may be useful in maximizing risk assessment Within the broader community. Moreover, a strong correlation has been shown between a high TG index and numerous unfavourable consequences following a stroke, including increased mortality and stroke recurrence.

TG index's linearity as an ischemic stroke indicator is suggested by the proportionate correlation between its increase and the prevention of ischemic stroke. According to our research, TG index may be useful in improving ischemic stroke risk classification for the general population.

DISCUSSION

Especially in low- and middle-income nations, stroke is a leading cause of mortality and disability. Improving post-stroke outcomes is crucial, and identifying high-risk patients and implementing effective secondary preventions is essential. Insulin resistance (IR) is prevalent in stroke patients, promoting atherosclerosis, hemodynamic disturbances, and platelet adhesion, potentially triggering stroke recurrence in IS patients.

The TyGIndex is amarker for insulinresistance, indicating a reduced sensitivity to insulin, a hormone essential for glucose

metabolism. It can help stratify individuals into risk categories for cardiovascular events based on their insulin resistance status. Higher TyG Index values indicate greater insulin resistance and metabolic dysfunction, known risk factors for cerebrovascular diseases. Clinicians can tailor treatment strategies by identifying individuals at higher risk, such as aggressive management of modifiable risk factors like hypertension, dyslipidemia, and obesity, and lifestyle interventions aimed at improving insulin sensitivity and metabolic health.

Regular monitoring of TyG Index levels can provide insights into the effectiveness of interventions, such as lifestyle modifications and pharmacological interventions. Changes in TyG Index levels over time can also indicate metabolic dysfunction and insulin resistance progression, allowing clinicians to intervene promptly and implement targeted interventions to prevent or delay cerebrovascular complications.

Recently, it retains to shown that the triglyceride Glucoseindex (TyG), a novel calculator for metabolic abnormalities, is linked to the Risk of cerebrovascular disease (CVD) in those who appear to be in good condition.

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