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Research Article

Predictive Value of Triglyceride-Glucose Index for Left Ventricular Hypertrophy in Hypertensive Patients

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ABSTRACT

Insulin Opposition (IR) is a significant affecting element in the pathogenesis of Left Ventricular Hypertrophy (LVH) in patients with hypertension. Fatty substance Glucose (TyG) record is a straightforward mark of IR. Notwithstanding, the proof on the relationship between TyG record and LVH is restricted.

Clinical information of 440 hypertensive patients were reflectively gathered and isolated into two gatherings as indicated by Left Ventricular Mass file (LVMI): LVH bunch (LVMI ≥ 115 g/m^2 (men) or ≥ 95 g/m^2 (ladies), n=94), non-LVH bunch (LVMI<115 g/m^2 (men) or <95 g/m^2 (ladies), n=346), and TyG record was determined in view of Fasting Plasma Glucose (FPG) and fatty substances (TG) levels.

The distinction in TyG file between two gatherings was genuinely critical (p=0.012). Connection investigation showed that LVMI was decidedly corresponded with TyG file (r=0.406, p<0.001). Multivariate strategic relapse examination results uncovered that orientation (OR=5.95, 95% CI: 2.565-13.8, p<0.001) and TyG file (OR=5.155, 95% CI: 1.304-20.38, p=0.019) were free affecting elements for the event of LVH in hypertensive patients. The region under the bend (AUC) for TyG file to anticipate LVH in hypertensive patients was 0.591 (95% CI: 0.526-0.656). The AUC for TyG record to anticipate LVH in male and female hypertensive patients was 0.704 (95% CI: 0.593-0.816) and 0.637 (95% CI: 0.556-0.719), separately.

TyG file is a free impacting factor for LVH in hypertensive patients, and unquestionably somewhat influences myocardial rebuilding in hypertensive patients. TyG file has a higher prescient incentive for LVH in male hypertensive patients.

Keywords: Triglyceride-glucose index; Hypertension; Insulin resistance; Left ventricular hypertrophy

INTRODUCTION

The quantity of individuals with hypertension overall was around 1.13 billion out of 2015, and the commonness of hypertension in grown-ups was around 30%-45%. With the further extension of the maturing populace and the increment of undesirable ways of life like high-fat eating routine, smoking, stationary, and keeping awake until late, the quantity of hypertensive patients will keep on expanding overall [1]. Hypertension, as one of the most widely recognized constant sicknesses around the world, requires our consideration. Left Ventricular Hypertrophy (LVH) is one of the normal subclinical objective organ harms brought about by hypertension, which can essentially expand the gamble of coronary atherosclerotic coronary illness, cardiovascular breakdown, stroke and, surprisingly, unexpected demise in hypertensive patients [2,3].

A few investigations have shown that Insulin Opposition (IR) can essentially build the gamble of hypertension [4-5]. Besides, there is a critical positive relationship among's IR and the occurrence pace of LVH in hypertensive patients [6-8]. In any case, a few examinations likewise have shown that there is no critical relationship among's IR and the occurrence of LVH [9]. The various ends might be credited to ethnic or geological contrasts of the chose populace. In past examinations, the greater part of the IR levels were assessed by Homeostasis Model

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evaluation of insulin obstruction (HOMA-IR). Nonetheless, the procurement of HOMA-IR relies upon the fasting insulin esteem, and the fasting insulin level is definitely not a standard test thing, and that implies that the IR levels of most patients can't be assessed. Triacylglycerol Glucose (TyG) file is a non-insulin subordinate straightforward IR list, which is modest and simple to get, and corresponds well with euglycemic-hyperinsulinemic clasp and HOMA-IR [10]. Studies have affirmed that drawn out height of TyG record is an indicator of type 2 diabetes, ischemic stroke, cardiovascular infection, and so on [11-13], however there are not many examinations on the connection between TyG file and LVH. This paper means to dissect the connection between TyG file and LVH in hypertensive patients.

MATERIALS AND METHODS/

Study population: The patients with fundamental hypertension who were hospitalized in the heart focal point of Hebei general medical clinic from January 2020 to January 2023 were reflectively chosen as the exploration objects. Incorporation rules: The individuals who were ≥18 years old and met any of the accompanying standards:

- Center Systolic Pulse (SBP) ≥140 or potentially Diastolic Circulatory Strain (DBP) ≥90 mmHg (1 mmHg=0.133 kPa) estimated multiple times on various days without antihypertensive medicine.
- Those with a past distinct determination of hypertension.

Avoidance rules:

- Intense cerebrovascular infection.
- Diabetes.
- Extreme liver or kidney brokenness (aminotransferase>multiple times the furthest reaches of typical reference esteem, assessed glomerular filtration rate<60 mL/min).
- Hematologic sickness or rheumatic insusceptible framework sickness treated with hormonal or immunosuppressive medications.
- Hyper or hypothyroidism.

Threatening cancer as indicated by the upsides of Leftventricular Mass File (LVMI), the subjects were partitioned into two gatherings: LVH was characterized as LVMI ≥ 115g/m^2 (male) or ≥ 95g/m^2 (female) 1, and hypertensive patients were isolated into non-LVH bunch and LVH bunch. This study was supported by the Morals Board of trustees of Hebei general medical clinic and was permitted to defer informed assent.

Data collection and definition: Segment information and clinical data of patients were gotten from electronic clinical records: Segment information included orientation, age, and so forth; clinical data included actual assessment (weight record (BMI), SBP, DBP, pulse, etc.), moking history, course of hypertension, research facility markers (first Fasting Plasma Glucose (FPG) after affirmation, serum creatinine, uric corrosive, assessed glomerular filtration rate (eGFR), all out Cholesterol (TC), fatty oil (TG), high thickness Lipoprotein Cholesterol (HDL-C), Low Thickness Lipoprotein Cholesterol (LDL-C) etc.), echocardiogram records (first Interventricular Septum Thickness (IVST) after affirmation, Left Ventricular back Wall Thickness (LVPWT), Left Ventricular end Diastolic Width (LVDD), etc.). Beat pressure, fatty oil Glucose (TyG) record, Left Ventricular Mass (LVM), and LVMI were determined from pattern information: Beat pressure=SBP (mmHg)-DBP (mmHg); TyG file=ln (TG (mg/dl) × FPG (mg/dl)/2). LVM and LVMI were determined by Devereux remedy equation 14: LVM=0.8 × 1.04 × {(IVST (cm)+LVPWT (cm)+LVDd (cm)^3-LVDd (cm)^3}+0.6; body surface region=0.0061× level (cm)+0.0128 × weight (kg)-0.1529; lVMI=LVM/body surface region.

Statistical analysis

SPSS25.0 programming and GraghPad Prism8.0.1 programming were utilized for measurable examination. Kolmogorov-Smirnov test was utilized to research the ordinariness of persistent variable dispersion. The estimation information fulfilling the ordinary dispersion were communicated as mean ± standard deviation, the autonomous example t test was directed for examination among gatherings, and Pearson connection investigation was performed to evaluate the relationship. Estimation information that didn't meet the typical dispersion were communicated as middle (interquartile dividing), Mann-Whitney U (two free examples rank aggregate test) was utilized for examination among gatherings, and Spearman relationship coefficient was utilized to evaluate the connection. The specification information were communicated as recurrence (rate), and the *Chi square* test was directed for examination between gatherings. The variables affecting the event of LVH in hypertensive patients were dissected by strategic relapse examination; recipient working trademark (ROC) bend investigation was performed to investigate the prescient worth of TyG record on the event of LVH in hypertensive patients. When $p<0.05$, the thing that matters was viewed as measurably huge.

RESULTS

Gauge information of the two gatherings of patients: As indicated by the consideration and avoidance rules, 440 patients were eventually included (Table 1), including 239 guys and 201 females, with a typical period of 53.99±13.93 years old. There were 94 cases in the LVH bunch and 346 cases in the non-LVH bunch, and the rate of LVH in hospitalized hypertensive patients was 27.2%. The commonness of LVH in female hypertensive patients was 34.3%, and the pervasiveness of LVH in male hypertensive patients was 10.5%. There were genuinely tremendous contrasts between the two gatherings as far as orientation, smoking history, age, SBP, beat pressure, serum creatinine, uric corrosive , TG, and TyG file (all $p<0.05$); there was no measurably huge distinction in course of hypertension, DBP, pulse, BMI, FPG, eGFR, TC, HDL-C, and LDL-C between the two gatherings (all $p>0.05$).

Table 1: Baseline data of both groups of patients.

	non-LVH group (n=346)	LVH group (n=94)	p value
Male, n (%)	214 (61.8)	25 (26.6)	<0.001
Smoking, n (%)	94 (27.2)	15 (16.0)	0.026
Course of hypertension (years)	3 (0.6,10)	5 (0.9,10)	0.079
Age (years)	53.23 ± 13.53	56.78 ± 15.07	0.028
SBP (mmHg)	151.40 ± 19.82	157.37± 21.68	0.011
DBP (mmHg)	92.13 ± 14.66	89.76 ± 15.33	0.168
Pulse pressure (mmHg)	57 (48,68)	65 (52,82.5)	<0.001
Heart rate (bpm)	77.69 ± 12.88	76.02 ± 14.76	0.28
BMI (kg/m^2)	26.90 ± 3.54	26.60 ± 4.14	0.527
FPG (mmol/L)	5.07 ± 0.66	5.12 ± 0.63	0.458
Serum creatinine (μmol/L)	70.26 ± 13.91	62.73 ± 13.43	<0.001
Uric acid (μmol/L)	355.64 ± 100.07	317.99 ± 97.18	0.001
eGFR (ml/min)	97.39 ± 13.94	96.89 ± 14.09	0.759
TC (mmol/L)	4.84 ± 1.06	4.77 ± 1.05	0.595
TG (mmol/L)	1.24 (0.95,1.73)	1.49 (1.05,2.05)	0.011
HDL-C (mmol/L)	1.21 ± 0.29	1.20 ± 0.30	0.678
LDL-C (mmol/L)	3.17 ± 0.79	3.07 ± 0.78	0.297
TyG index	8.55 ± 0.45	8.68 ± 0.44	0.012

Note: SBP: Systolic Pulse; DBP: Diastolic Pulse; BMI: Weight record; FPG: Fasting Plasma Glucose; eGFR: Assessed Glomerular Filtration Rate; TC: Absolute Cholesterol; TG: Fatty substance; HDL-C: High thickness Lipoprotein Cholesterol; LDL-C: Low thickness Lipoprotein Cholesterol; TyG: Triacylglycerol Glucose

The hypertensive patients were classified into four gatherings as per TyG file quartile values: Bunch 1 (TyG index<8.27, n=110), bunch 2 (8.27 ≤ TyG index<8.54, n=111), bunch 3 (8.54 ≤ TyG index<8.91, n=109) and bunch 4 (TyG index ≥ 8.91, n=110), with LVH commonness of 15.45%, 18.92%, 21.10% and 30%, separately. Relationship examination among LVMI and factors: Relationship investigation showed that LVMI was decidedly associated with course of hypertension, SBP, beat pressure, BMI, FPG, TG and TyG file (all p<0.05), and adversely corresponded with HDL-C (p=0.001) (Table 2).

Table 2: Correlation analysis between LVMI and variables.

	Correlation coefficient	p value
Age	0.016	0.739
Course of disease	0.105	0.028
SBP	0.171	<0.001
DBP	0.059	0.217

Pulse pressure	0.103	0.031
Heart rate	-0.066	0.169
BMI	0.125	0.009
FPG	0.136	0.004
Serum creatinine	0.034	0.482
Uric acid	0.032	0.498
eGFR	-0.008	0.865
TC	-0.059	0.214
TG	0.393	<0.001
HDL-C	-0.152	0.001
LDL-C	-0.043	0.363
TyG index	0.406	<0.001

Note: SBP: Systolic Pulse; DBP: Diastolic Pulse; BMI: Weight record; FPG: Fasting Plasma Glucose; eGFR: Assessed Glomerular Filtration Rate; TC: Absolute Cholesterol; TG: Fatty substance; HDL-C: High thickness Lipoprotein Cholesterol; LDL-C: Low thickness Lipoprotein Cholesterol; TyG: Triacylglycerol Glucose

Relapse examination of the impacting elements of LVH: Multivariate calculated relapse examination was performed with the presence of LVH as the reliant variable and orientation (male), smoking, age, SBP, beat pressure, serum creatinine, uric corrosive, TG, and TyG record as covariates. The results showed that orientation and TyG file were autonomous affecting variables of LVH in hypertensive patients ($p<0.05$), as displayed in Table 3.

Table 3: Regression analysis of the influencing factors of LVH.

	Univariate analysis		**Multivariate analysis**	
	OR (95%CI)	**p value**	**OR (95%CI)**	**p value**
Gender (Male)	4.475 (2.697-7.424)	<0.001	5.95 (2.565-13.8)	<0.001
Age	1.019 (1.002-1.036)	0.029	1.001 (0.976-1.026)	0.962
Smoking	0.509 (0.279-0.928)	0.028	1.617 (0.696-3.759)	0.264
SBP	1.014 (1.003-1.026)	0.012	1.008 (0.988-1.029)	0.434
Pulse pressure	1.026 (1.013-1.040)	<0.001	1.019 (0.993-1.045)	0.155
Serum creatinine	0.959 (0.942-0.977)	<0.001	0.994 (0.969-1.02)	0.67
Uric acid	0.996 (0.993-0.998)	0.001	0.997 (0.994-1.001)	0.144
TG	1.384 (1.016-1.886)	0.039	0.945 (0.41-2.179)	0.894
TyG index	1.917 (1.151-3.195)	0.012	5.155 (1.304-20.38)	0.019

Note: LVH: Left Ventricular Hypertrophy; SBP: Systolic Blood Pressure; TG: Triglyceride; TyG: Triacylglycerol Glucose

Predictzve value of TyG index for LVH in hypertensive patients: The region under the bend (AUC) for TyG record to anticipate LVH in hypertensive patients was 0.591 (95% CI:0.526-0.656), with a best removed worth of 8.453, Youden file of 0.164,

responsiveness of 0.713 and particularity of 0.451. The AUC for TyG file to anticipate LVH in male hypertensive patients was 0.704 (95% CI:0.593-0.816), with a best removed worth of 9.049, Youden record of 0.413, responsiveness of 0.6 and particularity of 0.813. The AUC for TyG file to foresee LVH in female hypertensive patients was 0.637 (95% CI:0.556-0.719), with a best removed worth of 8.453, Youden record of 0.25, responsiveness of 0.667 and particularity of 0.583 (Figures 1-3). TyG record has the most elevated prescient incentive for LVH in male hypertensive patients.

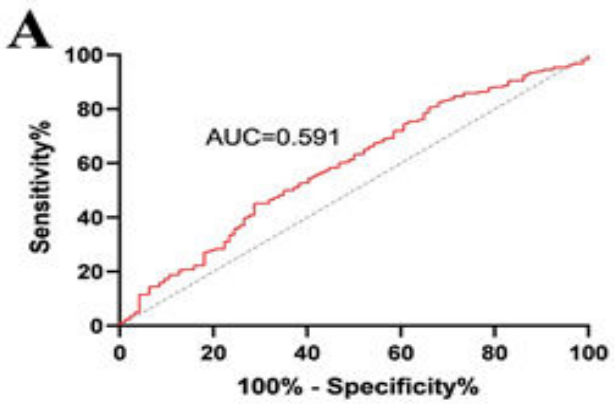

Figure 1: ROC curve of predictive value of TyG index for LVH in patients with hypertension. AUC: Area Under the Curve; ROC: Receiver Operating Characteristic; TyG: Triacylglycerol Glucose; LVH: Left Ventricular Hypertrophy.

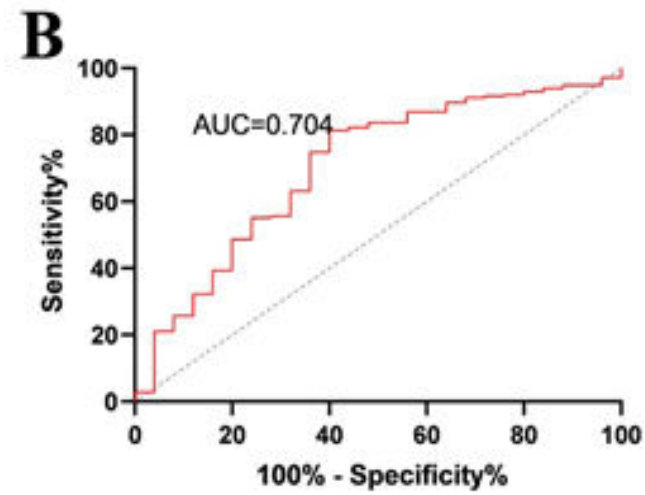

Figure 2: ROC curve of predictive value of TyG index for LVH in male patients with hypertension. AUC: Area Under the Curve; ROC: Receiver Operating Characteristic; TyG: Triacylglycerol Glucose; LVH: Left Ventricular Hypertrophy.

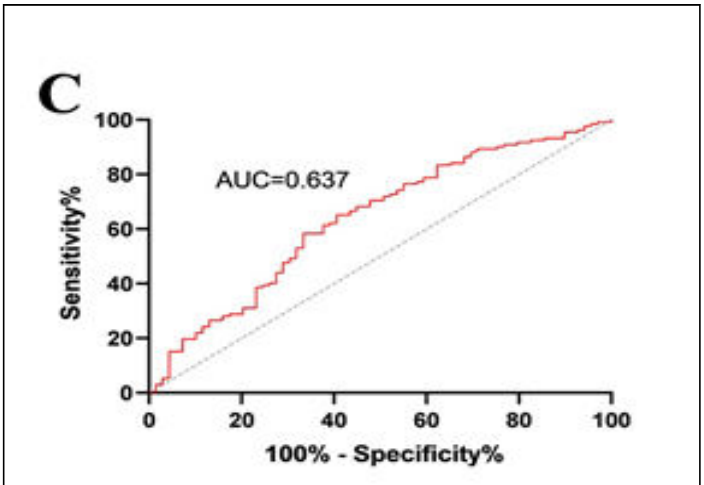

Figure 3: ROC curve of predictive value of TyG index for LVH in female patients with hypertension. AUC: Area Under the Curve; ROC: Receiver Operating Characteristic; TyG; Triacylglycerol Glucose; LVH: Left Ventricular Hypertrophy.

DISCUSSION

Albeit human existence hope is expanding step by step, hypertension, as an illness with high occurrence and numerous intricacies, genuinely influences individuals' life quality. LVH is one of the normal types of heart harm brought about by hypertension, which further builds the gamble of cardiovascular and cerebrovascular difficulties and passing in patients [2-3]. Studies have demonstrated the way that IR can build the gamble of LVH in hypertensive patients. In the concentrate by Shereef, et al., the recently analyzed hypertensive non-diabetic patients were chosen as the exploratory gathering, and sound individuals were chosen as the benchmark group. Connection examination showed that LVMI was exceptionally decidedly related with HOMA-IR (r=0.79, p<0.001) 6. The concentrate by Kianu, et al., found that HOMA-IR expanded the gamble of LVH by around 8-crease (OR=8.4, 95% CI=3.7-15.7, p<0.001) [7].

The clinical meaning of IR has not been clear since there is no all-around acknowledged clinical assessment file for IR. Euglycemic-hyperinsulinedmic cinch test is the "highest quality level test" for evaluating IR, however the trial interaction is muddled and costly, which isn't reasonable for clinical examination. In 2008, Simental-Mendia LE, et al., [15] suggested that TyG list can be utilized as a basic non-insulin-subordinate pointer for IR. In a relative report with the euglycemic-hyperinsulinedmic brace test, a decent connection between's TyG file and the "highest quality level test" was noticed [10]. TyG record can be gotten by the capability computation of TG and FPG values, and the upsides of fundamental pointers are helpful to gain. TyG record has shown great clinical importance in cardiovascular illness risk definition and guess [16-17], yet the review information about LVH is generally insufficient. In the concentrate by Cetin, et al., The outcomes showed that TyG file was essentially and decidedly corresponded with LVMI (r=0.335, p<0.001), and subsequent to adapting to frustrating variables, TyG record was autonomously connected with LVMI (p<0.001) [18]. In our review, TyG record was additionally fundamentally emphatically corresponded with

LVMI (r=0.406, p<0.001), and TyG file was an autonomous impacting factor for the event of LVH in hypertensive patients, and the occurrence of LVH step by step expanded with dynamically higher TyG file values.

IR might build the gamble of LVH in hypertensive patients through the accompanying components: first, hyperinsulinemia can intercede an overdrive of thoughtful sensory system movement [19] and hoist plasma catecholamine focus [20], which thusly straightforwardly or by implication causes cardiomyocyte hypertrophy by invigorating the development impact. What's more, the renin-angiotensin-aldosterone framework is overactivated, which can prompt the actuation of IR and mitogen enacted protein kinase in the heart, and actuate cardiovascular myocytes fibrosis and apoptosis. Studies have shown that the declaration of glucose carrier 4 is down-directed in IR state, bringing about diminished glucose take up. For this situation, cell energy necessities are generally reliant upon unsaturated fat oxidation, and the expanded take up of free unsaturated fat further prompts fat gathering in cardiovascular myocytes. Subsequently, IR undoubtedly somewhat manages myocardial renovating in hypertensive patients.

The outcomes likewise have uncovered that orientation is a free affecting variable for LVH in hypertensive patients. In this review, the commonness of LVH in female hypertensive patients was multiple times higher than that in male hypertensive patients. Contrasted with male body tissues, female body tissues have a lower take-up and use of glucose and a higher take-up of unsaturated fats. Past examinations have demonstrated that the event of LVH is related with corpulence. Be that as it may, in this review, there was no massive distinction in BMI between LVH bunch and non-LVH bunch. BMI is a circuitous mark of muscle versus fat substance, which can't precisely mirror the distinction in instinctive fat substance, while IR level is primarily connected with instinctive fat substance.

Prescient worth examination exhibited that TyG file was less significant in anticipating the event of LVH in hypertensive patients or female hypertensive patients, yet had high prescient incentive for LVH in male hypertensive patients, with AUC>0.7. This is reliable with past exploration results. The prescient worth of TyG record for LVH in hypertensive patients changes with orientation, and the basic system is presently hazy.

Impediments: This study is a review study, and albeit comparing consideration and rejection measures were laid out, predisposition might in any case exist.

This study is a solitary community study with generally restricted examples and the moderately little example size, which can't precisely mirror the widespread peculiarity.

The elements connected with patients' day to day routine like activity, rest, and liquor utilization were not broke down, which might bring about the shortfall of frustrating variables. As a review study, its discoveries should be additionally demonstrated by a bigger forthcoming review.

CONCLUSION

This study offers help to reach the determination that TyG record is a significant impact factor for LVH in hypertensive patients. The TyG record was emphatically corresponded with the pervasiveness of LVH, and the higher the TyG file, the higher the likelihood of LVH. Moreover, TyG record has a higher prescient incentive for LVH in male hypertensive populace. Resulting clinical work on the most proficient method to lessen the pervasiveness of LVH by regulating IR will require more randomized controlled clinical preliminaries in the future to decide better administration conventions.

CONFLICTS OF INTEREST

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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