



ASSOCIATION BETWEEN TRIGLYCERIDE–GLUCOSE (TyG) INDEX AND RISK OF METABOLIC DYSFUNCTION-ASSOCIATED FATTY LIVER DISEASE (MAFLD)

Khojiev B.B., Makhmudova L.I

Abstract. *The triglyceride–glucose (TyG) index is a simple, low-cost surrogate marker of insulin resistance and has recently emerged as a strong predictor of metabolic dysfunction-associated fatty liver disease (MAFLD). MAFLD is a highly prevalent liver disorder closely linked with obesity, type 2 diabetes mellitus, and metabolic syndrome. Growing evidence suggests that elevated TyG index is significantly associated with the presence, severity, and progression of MAFLD. This review summarizes current evidence on the association between TyG index and MAFLD and highlights its potential role in clinical risk stratification and early diagnosis.*

Keywords: TyG index, MAFLD, insulin resistance, NAFLD, metabolic syndrome, biomarkers.

1. Introduction

Metabolic dysfunction-associated fatty liver disease (MAFLD), previously known as nonalcoholic fatty liver disease (NAFLD), represents a spectrum of liver disorders characterized by hepatic fat accumulation in the presence of metabolic dysfunction. It affects approximately 25–30% of the global population and is strongly associated with insulin resistance.

Insulin resistance plays a central role in MAFLD pathogenesis. However, direct measurement of insulin resistance is complex and expensive. Therefore, surrogate markers such as the triglyceride–glucose (TyG) index have gained attention.

The TyG index is calculated using fasting triglycerides and fasting plasma glucose and is considered a reliable indicator of insulin resistance in large populations.

2. Mechanisms Linking TyG Index and MAFLD

2.1 Insulin Resistance Pathway

Elevated TyG index reflects systemic insulin resistance, which leads to:

- Increased lipolysis in adipose tissue
- Elevated free fatty acids in circulation
- Hepatic fat accumulation

2.2 Hepatic Lipogenesis

Insulin resistance enhances:



- De novo lipogenesis in the liver
- Reduced fatty acid oxidation
- Triglyceride accumulation in hepatocytes

2.3 Dyslipidemia and Glucose Toxicity

High TyG index reflects:

- Hypertriglyceridemia
 - Impaired glucose metabolism
- These metabolic abnormalities directly contribute to steatosis development.

2.4 Inflammation and Oxidative Stress

MAFLD progression is further driven by:

- Chronic low-grade inflammation
- Oxidative stress
- Mitochondrial dysfunction

3. Evidence from Clinical Studies

Recent studies consistently show a positive association between TyG index and MAFLD:

- A large meta-analysis including **over 100,000 participants** showed that higher TyG index significantly increases MAFLD risk (OR \approx 2–3)
- Another systematic review confirmed that TyG index has good diagnostic accuracy with AUC around **0.75** for MAFLD detection
- Observational studies indicate that individuals with higher TyG index have **2–6 times higher odds** of developing fatty liver disease

These findings suggest that TyG index is a strong and independent predictor of MAFLD.

4. Clinical Utility of TyG Index

4.1 Early Screening Tool

TyG index is useful in:

- Primary healthcare screening
- Identification of high-risk patients
- Early detection of metabolic dysfunction

4.2 Risk Stratification

Higher TyG values correlate with:

- Greater liver fat accumulation



- Increased fibrosis risk
- Worse metabolic profiles

4.3 Advantages

- Simple calculation
- Low cost
- No need for insulin measurement
- Suitable for large population studies

4.4 Limitations

- Cut-off values vary between populations
- Cannot directly measure liver fibrosis
- Influenced by diet and acute metabolic changes

5. Discussion

The TyG index has emerged as a promising biomarker bridging metabolic dysfunction and liver disease. Its strong correlation with insulin resistance makes it highly relevant for MAFLD prediction.

However, it should not replace imaging techniques (ultrasound, elastography, MRI), but rather complement them in a multi-modal diagnostic approach.

Future studies are focusing on:

- TyG combined with BMI (TyG-BMI)
- TyG-waist circumference index
- Machine learning models for MAFLD prediction

6. Conclusion

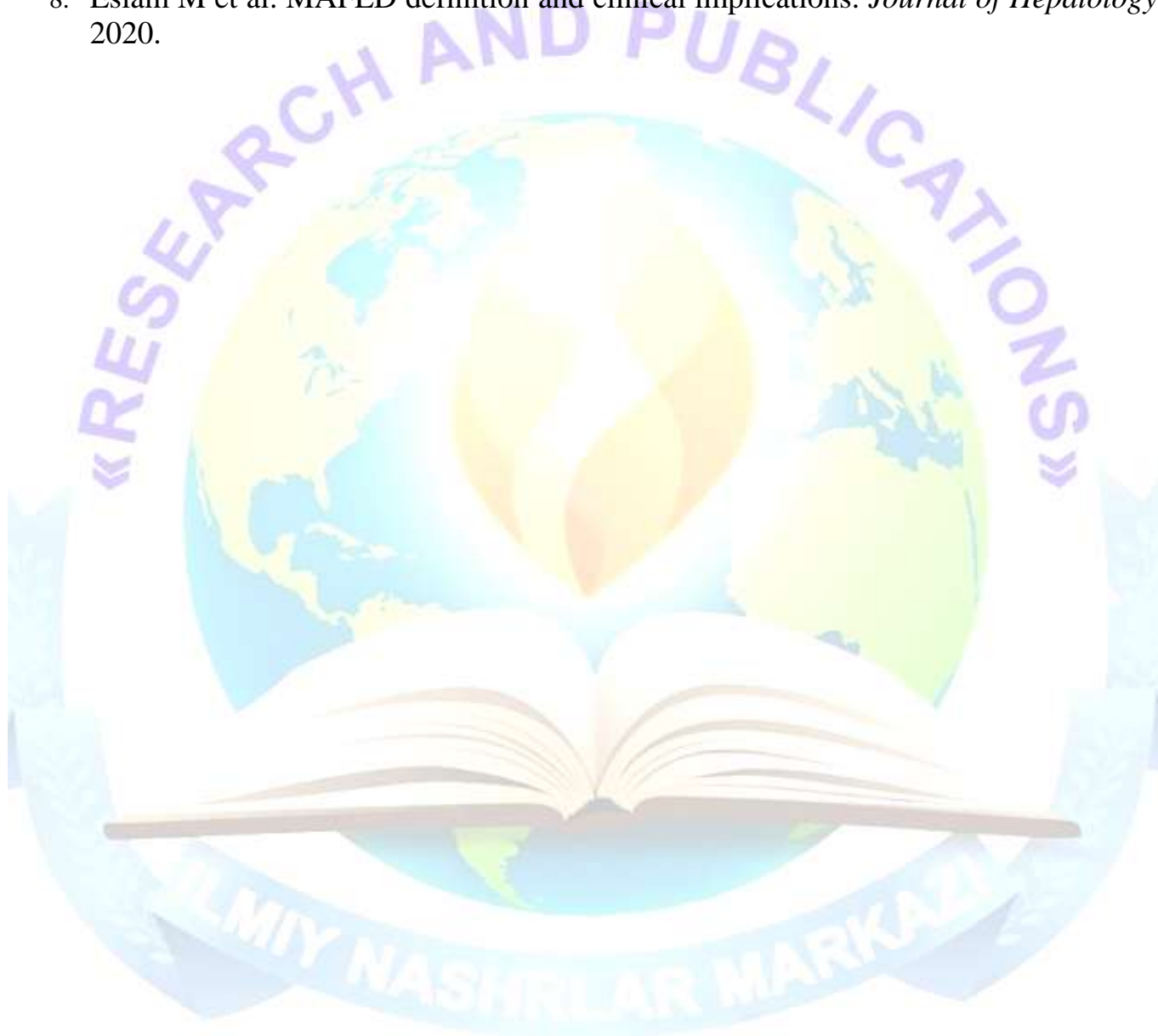
The triglyceride–glucose index is strongly associated with the risk of metabolic dysfunction-associated fatty liver disease. It serves as an effective, inexpensive, and practical surrogate marker of insulin resistance. Its integration into clinical practice may improve early detection and risk stratification of MAFLD, especially in resource-limited settings.

References

1. Ling Q, Chen J, et al. The triglyceride and glucose index and risk of nonalcoholic fatty liver disease: A dose–response meta-analysis. *Front Endocrinol*. 2022.
2. Wang J, Yan S, Cui W, et al. Diagnostic value of TyG index in MAFLD: Systematic review and meta-analysis. *Nutrients*. 2022.
3. Assaly R, et al. Triglyceride-glucose index and NAFLD risk. *Journal of Clinical Medicine*. 2022.



4. Alharthi J, Eslam M. Biomarkers of metabolic dysfunction-associated fatty liver disease. *J Clin Transl Hepatol*. 2022.
5. Tapper EB, Loomba R. Noninvasive assessment of liver fibrosis in metabolic disease. *Nat Rev Gastroenterol Hepatol*. 2018.
6. Younossi ZM et al. Global epidemiology of NAFLD and MAFLD transition. *Hepatology*. 2020–2021 updates.
7. Lee SH et al. Insulin resistance mechanisms and metabolic disease. *Diabetes & Metabolism Journal*. 2021.
8. Eslam M et al. MAFLD definition and clinical implications. *Journal of Hepatology*. 2020.





MUNDARIJA

| | | | |
|----|--|---|----|
| 1 | EXTRACURRICULAR MUSICAL ACTIVITIES IN GENERAL SECONDARY EDUCATION SCHOOLS. | D.M. Abdukhodirova | 4 |
| 2 | METHODOLOGY FOR ORGANIZING A CHOIR CIRCLE AND WORKING WITH A CHOIR | D.A. Karimova | 10 |
| 3 | САНОАТ КЛАСТЕРЛАРИ ЖАРАЁНЛАРИНИ БАҲОЛАШНИНГ ЎЗИГА ХОС ХУСУСЯТЛАРИ | Мамадалиев Аназхон Зиёдиллаевич. | 14 |
| 4 | VATAN TUYG'USINING SHUKUR XOLMIRZAYEV IJODIDA AKS ETISHI | Charos Parmonova | 23 |
| 5 | “АЛ-ФАТОВО-Л-ОЛАМГИРИЯ” АСАРИДА МЕРОСДАН МАҲРУМ ҚИЛУВЧИ ҲОЛАТЛАР ВА ҲАЖБ ИНСТИТУТИ | Саидова Севара Алишер қизи | 28 |
| 6 | PARAFINLAR ASOSIDA ALIFATIK AMINLAR OLISH TEXNOLOGIYASI | Xolmurodov Ashur Erkin o'g'li | 35 |
| 7 | KURASH SPORTIDA MODELLASHTIRISH METODINING QO'LLANISHI | Bo'riyev Kamol Suyunovich | 38 |
| 8 | INKLYUZIV TA'LIMNING HUQUQIY ASOSLARI | Shaydullayeva Kamola Shapulatovna Erkinova Zuxra Shokir qizi | 43 |
| 9 | TA'LIM TASHKILOTLARIDA ALOHIDA YORDAMGA MUHTOJ BOLALARNI TA'LIM OLISHINI QO'LLAB-QUVVATLASH TEXNOLOGIYALARI | Shaydullayeva Kamola Shapulatovna Bobomurodova Sevinch Abdug'ani qizi | 51 |
| 10 | ЎЗБЕКИСТОН РЕСПУБЛИКАСИ ДАВЛАТ ФУҚАРОЛИК ХИЗМАТИДА ИНСОН РЕСУРСЛАРИНИ РИВОЖЛАНТИРИШ (HRD) СЕРТИФИКАТЛАШ ТИЗИМИ: КОРЕЯ ТАЖРИБАСИ АСОСИДА ТАҲЛИЛ | Нишонова Нилуфар Шавкатовна | 58 |



| | | | |
|----|---|---|-----|
| 11 | ДИАГНОСТИКА КОММУНИКАТИВНОЙ КОМПЕТЕНТНОСТИ ОБУЧАЮЩИХСЯ В БИЛИНГВАЛЬНОЙ СРЕДЕ ПРИ ИЗУЧЕНИИ РКИ | Ислямова Сония Юнусовна | 75 |
| 12 | ROLE OF THE METHOD OF "DISCRIMINATED-TANDEM" DEVELOPING OF INTERCULTURAL COMMUNICATION COMPETENCE | Sh.I. Musayeva | 79 |
| 13 | AUTOMATIC DETECTION OF CULTURAL LACUNAE USING CORPUS TOOLS: A CORPUS-DRIVEN PIPELINE FOR ENGLISH-UZBEK COMPARABLE CORPORA | Raxmatullayeva Malika Mo'min qizi Ataboyev Nozimjon Bobojonovich | 88 |
| 14 | SUN'IY INTELEKTNING YANGI GEOSIYOSATI VA GLOBAL BOSHQARISH ZARURATI | Abdulahobova Zarina Abdugofur qizi | 98 |
| 15 | ZAMONAVIY SINXRON GENERATOR ALTERNATORINING ISHLASH PRINSIPI | Xudayberganov Bobur Abdiyeva Gulara Babaniyazovna | 104 |
| 16 | РОЛЬ РЕЛЕ И ТРАНСФОРМАТОРОВ В ЭЛЕКТРОЭНЕРГЕТИЧЕСКИХ СИСТЕМАХ | Худайберганов Бобур Абдиева Гулара Бабаниязовна | 109 |
| 17 | HARBIY FANLARNI O'QITISHDA INNOVATSION PEDAGOGIK TEXNOLOGIYALARDAN FOYDALANISHNING SAMARALI YO'LLARI | Narmurodov Ural Sulaymonovich | 113 |
| 18 | ВЛИЯНИЕ ТЕРАПИИ ЭМПАГЛИФЛОЗИНОМ НА ПЛОЩАДЬ ЖИРОВОЙ ТКАНИ У ЛИЦ С ХСН И ХБП: БИОИМПЕДАНСНЫЙ АНАЛИЗ | Худойбердиева Г.А. | 121 |
| 19 | ЭВОЛЮЦИЯ ЖЕНСКОЙ СУБЪЕКТНОСТИ В РУССКОЙ ЛИТЕРАТУРЕ XIX–XXI ВЕКОВ (НА МАТЕРИАЛЕ ТВОРЧЕСТВА А. С. ПУШКИНА И Л. Е. УЛИЦКОЙ) | Кабулова М.Т. Рейпназарова А.М. | 129 |
| 20 | AUTO CAD DASTURI VOSITASIDA MUAMMOLI METODNI CHIZMACHILIK DARSLARIDA QO'LLASH | Rashidov Furqat Abdalim o'g'li | 139 |
| 21 | AQLIY HUJUM METODINI AUTO CAD DASTURI YORDAMIDA CHIZMACHILIK DARSLARIDA QO'LASH | Rashidov Furqat Abdalim o'g'li Fozilova Xusnora Dustmurod qizi | 144 |