pISSN 2287-2728
eISSN 2287-285X

CLINICAL and MOLECULAR HEPATOLOGY

https://doi.org/10.3350/cmh.2022.0409
Clinical and Molecular Hepatology 2023;29:179-181

Letter to the Editor

Correspondence on Letter regarding "The usefulness of metabolic score for insulin resistance for the prediction of incident non-alcoholic fatty liver disease in Korean adults"

Jun-Hyuk Lee[1,2], Kyongmin Park[2,3], Hye Sun Lee[4], Hoon-Ki Park[2,3], Jee Hye Han[1], and Sang Bong Ahn[5]

[1]Department of Family Medicine, Nowon Eulji Medical Center, Eulji University School of Medicine, Seoul; [2]Department of Medicine, Graduate School of Hanyang University, Seoul; [3]Department of Family Medicine, Hanyang University College of Medicine, Seoul; [4]Biostatistics Collaboration Unit, Department of Research Affairs, Yonsei University College of Medicine, Seoul; [5]Department of Internal Medicine, Nowon Eulji Medical Center, Eulji University School of Medicine, Seoul, Korea

Keywords: Insulin resistance; Metabolic score for insulin resistance; Homeostatic model assessment for insulin resistance; Non-alcoholic fatty liver disease; Fatty liver

Dear Editor,

We appreciate Dr. Lee's interest in this study. As Dr. Lee[1] commented in the letter, the metabolic score for insulin resistance (METS-IR) has been used as a simple, reliable, and reproducible surrogate insulin resistance (IR) marker in the South American population.[2,3] However, several Korean epidemiological studies using METS-IR[4-6] lack validation and cut-off points that would help to identify IR in Koreans. A follow-up study is needed to compare METS-IR with the hyperinsulinemic-euglycemic index in order to determine whether reflects it insulin sensitivity well and if it is more reliable than the homeostatic model assessment for IR (HOMA-IR) used in the general Korean population.

The formula that constitutes METS-IR uses triglyceride levels, which are affected by multiple factors, including arterial blood pressure, alcohol use, carbohydrate intake, and use of medications such as diuretics and oral contraceptives.[7] We adjusted for hypertension, alcohol use, and energy intake because such factors also contribute to nonalcoholic fatty liver disease (NAFLD).[8-10] However, the lack of information in the Korean Genome and Epidemiological Study dataset about specific medication use could serve as a potential confounder in our study.[11] Despite this limitation, there is also the pos-

Corresponding author : **Jee Hye Han**
Department of Family Medicine, Nowon Eulji Medical Center, Eulji University School of Medicine, 68 Hangeulbiseok-ro, Nowon-gu, Seoul 01830, Korea
Tel: +82-2-970-8518, Fax: +82-2-970-8862, E-mail: hanjh1611@eulji.ac.kr
https://orcid.org/0000-0003-4002-3453

Sang Bong Ahn
Department of Internal Medicine, Nowon Eulji Medical Center, Eulji University School of Medicine, 68 Hangeulbiseok-ro, Nowon-gu, Seoul 01830, Korea
Tel: +82-2-970-8515, Fax: +82-2-970-8862, E-mail: dr486@eulji.ac.kr
https://orcid.org/0000-0001-7419-5259

Editor: Seung Up Kim, Yonsei University College of Medicine, Korea

Received : Nov. 16, 2022 / **Accepted :** Nov. 17, 2022

sibility that the potential effect of the confounder was attenuated because we used community-based cohort data to analyze a large population. Further clinical trials should be performed with controlling for potential confounding variables to verify the association between METS-IR and NAFLD.

Current guidelines for management of NAFLD state that radiologic methods, such as abdominal ultrasonography, controlled-attenuated parameter, or unenhanced abdominal computed tomography, are acceptable to diagnose hepatic steatosis.[8] Serologic surrogate markers, such as NAFLD-liver fat score, hepatic steatosis index, or fatty liver index, can be used to assess hepatic steatosis if radiological examinations are infeasible.[8] We believe that METS-IR will be less accurate for diagnosis of hepatic steatosis than radiologic tests or serologic surrogate markers for hepatic steatosis. This is because METS-IR was developed as a surrogate marker for IR. We do not claim to use METS-IR as a single predictive model for NAFLD; if fatty liver disease has not yet developed, abdominal ultrasonography or abdominal computed tomography will not provide additional information about the risk of developing NAFLD. As IR is closely related to NAFLD, we believe that the assessment and management of IR are important strategies for the early prevention and management of NAFLD. In clinical practice, HOMA-IR is the most commonly used surrogate marker for IR. However, serum insulin level is not routinely measured in the general clinical field, so MET-IR can be applied more easily than HOMA-IR even though METS-IR uses a more complex formula. In our study, METS-IR was not inferior to HOMA-IR in predicting the prevalence of NAFLD, and it was superior to HOMA-IR in predicting the incidence of NAFLD. Therefore, our findings suggest that METS-IR can be used as an IR marker in patients with or who are at risk of developing NAFLD. Further experimental studies and clinical trials should be performed to elucidate the mechanism by which METS-IR is positively related to NAFLD and negatively related to advanced liver fibrosis, considering the changes in METS-IR values over time. Further studies on the genetic variations affecting METS-IR values, hepatic steatosis, and liver fibrosis are also necessary.

Authors' contribution

Study concept and design: Jun-Hyuk Lee, Jee Hye Han, and Sang Bong Ahn; Data collection: Jun-Hyuk Lee, Kyongmin Park, Hye Sun Lee, and Hoon-Ki Park; Data analysis and interpretation: Jun-Hyuk Lee, Jee Hye Han, and Sang Bong Ahn; Manuscript writing: Jun-Hyuk Lee, Jee Hye Han, and Sang Bong Ahn. Final approval of the manuscript: All authors

Conflicts of Interest

The authors have no conflicts to disclose.

REFERENCES

1. Lee HW. Letter regarding "The usefulness of metabolic score for insulin resistance for the prediction of incident nonalcoholic fatty liver disease in Korean adults". Clin Mol Hepatol 2023;29:169-170.
2. Bello-Chavolla OY, Almeda-Valdes P, Gomez-Velasco D, Viveros-Ruiz T, Cruz-Bautista I, Romo-Romo A, et al. METS-IR, a novel score to evaluate insulin sensitivity, is predictive of visceral adiposity and incident type 2 diabetes. Eur J Endocrinol 2018;178:533-544.
3. Liu XZ, Fan J, Pan SJ. METS-IR, a novel simple insulin resistance indexes, is associated with hypertension in normal-weight Chinese adults. J Clin Hypertens (Greenwich) 2019;21:1075-1081.
4. Yoon J, Jung D, Lee Y, Park B. The metabolic score for insulin resistance (METS-IR) as a predictor of incident ischemic heart disease: a longitudinal study among Korean without diabetes. J Pers Med 2021;11:742.
5. Lee YC, Lee JW, Kwon YJ. Comparison of the triglyceride glucose (TyG) index, triglyceride to high-density lipoprotein cholesterol (TG/HDL-C) ratio, and metabolic score for insulin resistance (METS-IR) associated with periodontitis in Korean adults. Ther Adv Chronic Dis 2022;13:20406223221122671.
6. Lee JH, Kwon YJ, Park K, Lee HS, Park HK, Han JH, et al. Metabolic score for insulin resistance is inversely related to incident advanced liver fibrosis in patients with non-alcoholic fatty liver disease. Nutrients 2022;14:3039.
7. Steinmetz J, Panek E, Siest G, Gueguen R. Factors affecting the concentration of triacylglycerols (triglycerides) in plasma: refer-

Abbreviations:

HOMA-IR, homeostatic model assessment for insulin resistance; IR, insulin resistance; METS-IR, metabolic score for insulin resistance; NAFLD, nonalcoholic fatty liver disease

ence values for adults. Clin Chem 1979;25:924-932.
8. Choi JH, Sohn W, Cho YK. The effect of moderate alcohol drinking in nonalcoholic fatty liver disease. Clin Mol Hepatol 2020;26:662-669.
9. Kang SH, Lee HW, Yoo JJ, Cho Y, Kim SU, Lee TH, et al. KASL clinical practice guidelines: management of nonalcoholic fatty liver disease. Clin Mol Hepatol 2021;27:363-401.
10. Hydes TJ, Ravi S, Loomba R, Gray EM. Evidence-based clinical advice for nutrition and dietary weight loss strategies for the management of NAFLD and NASH. Clin Mol Hepatol 2020;26:383-400.
11. Kim Y, Han BG; KoGES Group. Cohort profile: the Korean Genome and Epidemiology Study (KoGES) consortium. Int J Epidemiol 2017;46:e20.