

Reply

Reply to Mahat, R.K.; Rathore, V. Comment on “Xiang et al. Association between the Triglyceride-Glucose Index and Vitamin D Status in Type 2 Diabetes Mellitus. *Nutrients* 2023, 15, 639”

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We are pleased to see that Mahat and Rathore [1] have commented on our paper studying the association between the triglyceride glucose index and vitamin D status in type 2 diabetes mellitus [2]. The authors have pointed out that the formula: triglyceride-glucose (TyG) index = $\text{Ln} [\text{fasting triglyceride (mg/dL)} \times \text{fasting glucose (mg/dL)} / 2]$, was incorrect in our previous study [2]. They have also suggested using the following formula to calculate the TyG index values: $\text{Ln} [\text{fasting triglycerides (mg/dL)} \times \text{fasting glucose (mg/dL)} / 2]$. The reason for their concern was that the formula to calculate the TyG index was first proposed by Simental et al. in 2008 [3], which was consistent with that used in our study. However, Simental et al. clarified a mistake in the formula in 2020 and corrected it with another formula: $\text{Ln} [\text{fasting triglycerides (mg/dL)} \times \text{fasting glucose (mg/dL)} / 2]$ [4].

We read with great interest the article by Simental et al. [4]. However, the authors have not stated the reason for the correction of the formula. Further, we have searched a large number of literature, including some papers published in some influential journals, and found that most of them employed the following formula to calculate the TyG index: $\text{Ln} [\text{fasting triglyceride (mg/dL)} \times \text{fasting glucose (mg/dL)} / 2]$ both before 2020 [5–9] and after 2020 [10–16]. However, some studies used the following formula to calculate the TyG index: $\text{Ln} [\text{fasting triglyceride (mg/dL)} \times \text{fasting glucose (mg/dL)} / 2]$ [17,18]. Currently, there is no consensus regarding which of them would be better to appropriately identify the presence of insulin resistance or vitamin D deficiency.

It made us feel confused about the use of the TyG index, and thus, we made a comparison of the TyG cutoff points between the two formulas using the same statistical settings. The results showed that $\text{TyG} > 4.86$ was determined as the optimal cutoff point for the identification of VDD when using the formula $\text{Ln} [\text{fasting triglycerides (mg/dL)} \times \text{fasting glucose (mg/dL)} / 2]$ to calculate the TyG index values, which was different from the cutoff point when using the formula $\text{Ln} [\text{fasting triglyceride (mg/dL)} \times \text{fasting glucose (mg/dL)} / 2]$ to calculate the TyG index values. To our surprise, although the cutoff points were different, the sensitivity (75.0%) and specificity (41.9%) were the same regardless of which formula was used (Table 1).

Table 1. Comparison of the cutoff points of the TyG index calculated using different formulas for the identification of vitamin D deficiency.

	TyG 1	TyG 2
Cutoff points	9.03	4.86
Sensitivity	75.0%	75.0%
Specificity	41.9%	41.9%
AUC	0.647	0.647

The optimal cutoff points for the TyG index were determined using receiver operating characteristic (ROC) curve analysis. $TyG\ 1 = \ln [fasting\ triglyceride\ (mg/dL) \times fasting\ glucose\ (mg/dL)/2]$, $TyG\ 2 = \ln [fasting\ triglyceride\ (mg/dL) \times fasting\ glucose\ (mg/dL)]/2$. AUC is the area under the curve.

To our knowledge, this study demonstrated for the first time that the two most commonly used formulas for calculating the TyG index have the same predictive value for the identification of vitamin D deficiency, although their cutoff points were different. The comparison of the TyG index using the two formulas in subsequent more large-scale studies may provide more evidence in choosing a more appropriate formula.

Thank you again for your interest in our article.

Author Contributions: Q.X., H.X. and Y.L. (Youshuo Liu) conceived and designed this study and wrote the manuscript. Q.X., H.X., L.L. and Y.L. (Yiyang Liu) obtained the data and performed the analyses. J.Z., S.L. (Shuzhen Lu), S.L. (Shuang Li), Y.W. (Yanjiao Wang) and Y.W. (Yi Wang) assisted in data interpretation and made some revisions. J.H. and Y.N. provided professional methods and statistical support. All authors have read and agreed to the published version of the manuscript.

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