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TRIGLYCERIDE-GLUCOSE (TYG) INDEX COMPUTATION AND CUT-OFF

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INTRODUCTION

TyG index is a product of fasting plasma glucose (FPG) and triglyceride (TG). It has been proposed as a numerical expression of insulin resistance (IR) (1). The sensitivity and specificity of TyG index is compatible with other markers for IR (2-5). Unlike the homeostasis model assessment (HOMA) and quantitative insulin sensitivity check index (QUICKI), insulin is not included in TyG index (6). This simplicity may have practical outcomes including more accessibility and less cost. These are especially important in low-income populations, where the risk for metabolic syndrome and diabetes are high (7-9). However, the age and sex dependent cut-off values for TyG are not well established. The second problem about TyG cut-off values is related to its computation. Any error in computation must be corrected in order to provide a unique reference and to facilitate the comparison of different data. The original equation of TyG index is: ln [FPG(mg/dL) × TG (mg/dL)/2] (1). The reported normal cut-offs values for TyG in literature are roughly around two levels: ~4 and ~8 (1-4). The cause of this difference is due to the position of 2 in TyG formula. Although all author use above equation, their numerical calculations are not similar. In fact according to the PubMed database, it seems that most authors compute TyG by this formula: ln [FPG(mg/dL) × TG (mg/dL)]/2. Using the reported FPG and TG values in 8 ISI- indexed articles their TyG indices were re-calculated (Table 1). The TyG index was also simulated for different ranges of TG and FPG using R software (http://www.R-project.org, Vienna, Austria, 2013). The simulated TyG index value for normally proposed TG and FPG series was 7.467-8.923 based on original formula. Obviously when the final division in TyG formula applied out off the square bracket these TyG index values approximately fall to around the half ranges: ie 4.080-4.808. These two simulated ranges change to 8.9-9.4 and 4.8-5 for abnormally high FPG and TG values respectively. This brief survey explored a simple but potentially important inconsistency about TyG index value. Although the age and sex dependence of TyG index has been well documented, existing discrepancy for TyG index values is not basically related to sampled population. It is due to the different calculation of TyG index formula. In comparison to the original formula, the TyG index has been reported correctly only in few articles. In these cases the values were roughly around the ~8 (3, 5, 11). Since the most prevalent value that could be

Table 1. The reported TyG indices and their recalculated values

Ref.	No.	FPG	TG	TyG	TyG1	TyG2
1	488	94.7	162.2	4.75	8.946	4.819
	300	95.8	200.5	4.83	9.169	4.931
	407	88.9	147.7	4.62	8.789	4.741
	67	91.9	214	4.84	9.193	4.943
	63	104.9	179	4.63	9.147	4.920
	82	108.8	220.5	4.94	9.392	5.042
	17	91.8	187.8	4.79	9.061	4.877
	37	93.8	187.1	4.97	9.079	4.886
	20	108.2	40	4.96	7.679	4.186
	55	113.6	40.9	5.02	7.750	4.221
2	340	96.2	98.6	4.51	8.464	4.578
	283	93.3	94.9	4.49	8.395	4.544
	57	110.8	116.8	4.65	8.775	4.734
3	11	88.3	168.3	3.7	8.913	4.803
	34	95.5	194.9	5.3	9.138	4.915
	22	113.5	230.5	5.5	9.478	5.086
	32	136.9	292.3	5.6	9.903	5.298
4	455	91	101	8.02	8.432	4.562
5	104	NR	NR	8.62	I	I
	26	NR	NR	8.83	I	I
	22	NR	NR	8.88	I	I
	11	NR	NR	8.97	I	I
6	70	NR	NR	8.792	I	I
	37	NR	NR	8.792	I	I
	35	NR	NR	8.433	I	I
7	12	NR	NR	3.8	I	I
	12	NR	NR	4	I	I
8	187	102	142	3.8	8.887	4.790
	143	96	122	3.7	8.675	4.684

No: number of samples, FPG: fasting plasma glucose (mg/dL), TG: triglyceride (mg/dL), TyG: reported values in reference, TyG1: recalculated values based on ln[FPG(mg/dL) × TG (mg/dL)/2], TyG2: recalculated values based on ln[FPG(mg/dL) × TG (mg/dL)]/2, NR: Not Reported, I: incomputable.

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observed for TyG index in literatures was roughly around the ~4 (1-2, 7-8, 10) probably it would be better to refer to a modified form of original formula. Otherwise the numerical differences are unavoidable.

Conflict of interest

The author declares that there is no conflict of interest.

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