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RESEARCH ARTICLE

Relationship between obesity and the triglyceride–glucose index in adults: A systematic review

Relación entre la obesidad y el índice triglicéridos-glucosa en adultos: una revisión sistemática

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KEYWORDS

Obesity

Triglyceride-glucose index

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ABSTRACT

Introduction: The Triglyceride–Glucose Index (TyG) is an indicator with potentially high reliability in the measurement of metabolic risk in adults with obesity, therefore, the objective of the study was to analyze the relationship between obesity and the TyG in adults.

Methods: A systematic review was conducted following the PRISMA 2020 guidelines, with the protocol registered in PROSPERO (CRD420251134791). Searches were performed in PubMed, Scopus, and Web of Science (Core Collection) for studies published from January 2020 to July 2025 in English and Spanish, using MeSH-based terms: ("obesity" OR "overweight" OR "abdominal obesity" OR "visceral adiposity") AND ("triglyceride–glucose index" OR "TyG index" OR "TyG"). Methodological quality was evaluated with the Newcastle–Ottawa Scale (NOS) and evidence certainty with GRADE.

Results: Fourteen observational studies (n = 115,458 participants; 78.6% Asia, 14.3% Americas, 7.1% Europe) were included. Reported TyG cut-offs for identifying obesity ranged from 8.7 to 9.1, and higher TyG values were consistently associated with greater odds of obesity (OR/HR 1.7–4.3, 95% CI where available). Discriminatory capacity was moderate-to-high (AUC 0.77–0.92). TyG-derived indices (TyG-BMI, TyG-WC, TyG-WWI) further improved predictive accuracy. Across outcomes, certainty of evidence ranged from low to moderate due to heterogeneity and observational designs.

Conclusions: The TyG index is a valid and consistent marker of insulin resistance and adiposity, strongly associated with general, abdominal, and sarcopenic obesity. Its simplicity and low cost support its use for early screening and metabolic risk stratification in clinical and public health settings.

PALABRAS CLAVE

Obesidad

Índice triglicéridos-glucosa

Resistencia a la insulina

Síndrome metabólico

Revisión sistemática

RESUMEN

Introducción: El índice triglicéridos-glucosa (TyG) es un indicador con una fiabilidad potencialmente alta en la medición del riesgo metabólico en adultos con obesidad, por lo que el objetivo del estudio fue analizar la relación entre la obesidad y el TyG en adultos.

Métodos: Se realizó una revisión sistemática siguiendo las directrices PRISMA 2020, con el protocolo registrado en PROSPERO (CRD420251134791). Se realizaron búsquedas en PubMed, Scopus y Web of Science (Core Collection) de estudios publicados entre enero de 2020 y julio de 2025 en inglés y español, utilizando términos basados en MeSH: («obesidad» O «sobrepeso» O «obesidad abdominal» O «adiposidad visceral») Y («índice triglicéridos-glucosa» O «índice TyG» O «TyG»). La calidad metodológica se evaluó con la escala de Newcastle-Ottawa (NOS) y la certeza de la evidencia con GRADE.

Resultados: Se incluyeron catorce estudios observacionales (n = 115 458 participantes; 78,6 % Asia, 14,3 % América, 7,1 % Europa). Los valores de corte del TyG comunicados para identificar la obesidad oscilaron entre 8,7 y 9,1, y los valores más altos del TyG se asociaron de forma sistemática con una mayor probabilidad de obesidad (OR/HR 1,7-4,3, IC del 95 % cuando estaba disponible). La capacidad discriminatoria fue de moderada a alta (AUC 0,77-0,92). Los índices derivados del TyG (TyG-IMC, TyG-CC, TyG-WWI) mejoraron aún más la precisión predictiva. En todos los resultados, la certeza de la evidencia osciló entre baja y moderada debido a la heterogeneidad y los diseños observacionales.

Conclusiones: El índice TyG es un marcador válido y consistente de la resistencia a la insulina y la adiposidad, fuertemente asociado con la obesidad general, abdominal y sarcopénica. Su simplicidad y bajo coste respaldan su uso para la detección precoz y la estratificación del riesgo metabólico en entornos clínicos y de salud pública.

KEY MESSAGES

1. The triglyceride–glucose index showed consistent positive associations with general and abdominal/visceral obesity in adults and demonstrated acceptable to good discriminatory capacity across studies.
2. Adults with higher TyG values had an increased likelihood of obesity, including visceral and sarcopenic phenotypes, based on adjusted models reported in multiple studies.
3. TyG correlated positively with anthropometric and adiposity indicators (e.g., visceral fat, BMI, and waist circumference), supporting its usefulness as a marker of central adiposity and cardiometabolic risk
4. According to the studies included (n = 115,458), evidence was geographically concentrated in Asia and supported by overall good methodological quality; however, certainty ranged from low to moderate due to heterogeneity and observational designs.

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INTRODUCTION

Obesity can be defined as an excessive accumulation of fat that can be detrimental to health1. Obesity has become one of the main public health problems worldwide, as its prevalence is growing every day and this leads to many complications. In 2022, more than 890 million adults were living with obesity[1,2]. These figures are very worrying as they reflect the increase in the number of people with this condition, which directly impacts both developed and developing countries. The impact of obesity goes beyond a simple increase in body fat, as it is intrinsically linked to the development of various metabolic disorders. These include high blood pressure, type 2 diabetes, dyslipidemia, and metabolic syndrome. These conditions not only negatively affect quality of life, but also significantly increase cardiovascular mortality and morbidity[3,4]. These diseases interact in a vicious cycle, where obesity acts as a factor that initiates and aggravates metabolic alterations, while the latter perpetuate insulin resistance, low-grade chronic inflammation, and endothelial dysfunction[5-7].

In this regard, indices are crucial for assessing or anticipating obesity, as they provide an objective measurement of the health risk associated with excess body fat. These indices go beyond simple numbers and offer a deeper understanding of body composition and its metabolic implications, allowing for an objective, standardized, and comparative assessment of excess body fat and its associated risks[8-10]. There is no single perfect indicator, so different anthropometric and biochemical indices are used, each with advantages and limitations[11]. These transform simple data into health assessment tools, with which obesity and possible complications can be prevented, diagnosed and intervened rapidly. Specifically, the Triglyceride/Glucose Index (TyG)[12] has emerged as a useful clinical marker for assessing insulin resistance, which is a condition closely associated with obesity and an increased risk of developing other metabolic diseases. Unlike traditional anthropometric indices, this index incorporates biochemical parameters.

It is easy and inexpensive to calculate because it only requires fasting blood triglyceride and glucose results, which are routinely tested in both hospitals and clinical laboratories. It was first proposed and validated by Simental-Mendía et al.[12] and has proven to be an accurate diagnostic tool in studies of cardiometabolic diseases12-15. It is measured using the formula: TyG index = Ln (fasting triglycerides [mg/dL] x fasting glucose [mg/dL]) /2 or TyG index = Ln (fasting triglycerides [mmol/L] x 88.57 x fasting glucose [mmol/L] x 18) /2)[12,15-17]. It has been extensively studied in various populations worldwide in relation to insulin resistance disorders and cardiovascular disease[16-18]. It has also been used in predicting the onset of diabetes mellitus, in assessing pancreatic -cell function, and in the presence of metabolic syndrome and cardiovascular disease risk in various populations worldwide[13,17,18]. It has shown a significant association with cardiometabolic risk factors, vascular disorders, and mortality. A high TyG index value has been associated with the onset of the above noncommunicable diseases and related complications[18-20].

Although there is much published evidence that has linked TyG to insulin resistance and metabolic disease, few studies have focused specifically on its relationship to obesity. Most previous research has examined TyG in other contexts such as in individuals with multiple metabolic risk factors, rather than looking at obesity as a specifically independent condition. This knowledge gap may limit the understanding of the direct, bidirectional association between TyG and obesity. A comprehensive summary of the published evidence could clarify the diagnostic and predictive value of the TyG index in obesity and reinforce its role in early detection, risk stratification and clinical follow-up.

Therefore, the objective of this systematic review was to analyze the relationship between obesity and the triglyceride–glucose (TyG) index in adults.

METHODS

Study Design and Protocol Registration

This systematic review was conducted in accordance with the PRISMA 2020 statement21. The protocol was prospectively registered in PROSPERO (CRD420251134791) on 29 July 2025, prior to data collection and screening. Any deviations from the protocol are documented in Supplementary Material 1, and the complete version is available at: https://www.crd.york.ac.uk/PROSPERO/view/CRD420251134791.

Eligibility Criteria

Observational studies (cross-sectional or cohort) including adults aged ≥18 years were eligible for inclusion. The exposure of interest was the triglyceride–glucose (TyG) index or TyG-derived indices (including TyG-BMI, TyG-WC, and TyG-WHtR).

The outcomes were specified in advance and ranked hierarchically for methodological clarity. Primary or critical outcomes comprised obesity phenotypes directly reflecting adiposity, including general obesity, abdominal or visceral obesity, and sarcopenic obesity, as defined by each study. Secondary or non-critical outcomes included metabolic and prognostic data related to obesity, such as diabesity and metabolic dysfunction-associated fatty liver disease (MAFLD). Comparators were defined according to each study's design (e.g., TyG categories, quantiles, or continuous exposure). Eligible articles were full text, published in English or Spanish, and provided sufficient information on study design, exposure and outcome definitions, and effect estimates. There were no restrictions on sex or ethnicity. Exclusion criteria were pediatric populations, interventional or experimental studies; reviews, editorials, or letters without original data; and studies that did not have adequate definitions of exposure or outcomes.

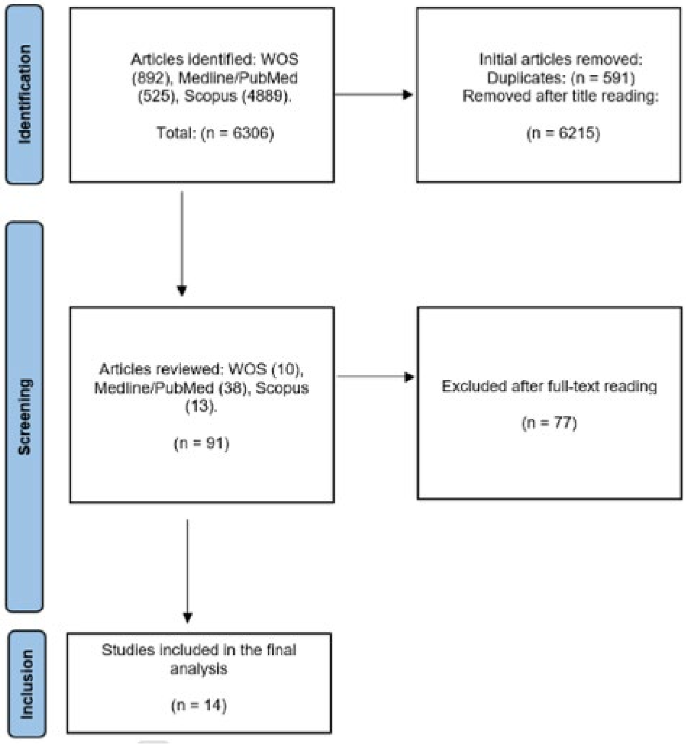
Information Sources and Search Strategy

Searches were performed in MEDLINE (PubMed), Scopus, and Web of Science Core Collection on 1 August 2025, covering publications from 1 January 2020 to 31 July 2025. No language restrictions beyond English and Spanish were applied. The following MeSH-based strategy was used: ("triglyceride glucose index" OR "triglyceride–glucose index" OR "TyG index" OR "TyG") AND (obesity[MeSH] OR "visceral adiposity" OR "abdominal obesity" OR "sarcopenic obesity" OR MAFLD) NOT (review[Publication Type])
Reference lists of included studies and relevant reviews were also screened to identify additional eligible articles. Complete search strategies for each database are provided in Supplementary Material 2.
The NOT operator was applied only to exclude secondary literature (e.g., reviews and meta-analyses) and non-original publication types, in order to improve the specificity of the search and the efficiency of the selection. This operator was not used to exclude populations, exposures, or outcomes of interest. To minimize the risk of overlooking relevant primary studies, the reference lists of the included articles were manually reviewed.

Study Selection

All retrieved records were exported to Microsoft Excel for identification and removal of duplicates, then imported into Rayyan QCRI for independent, blinded review by two reviewers. Discrepancies were resolved by consensus or by intervention of a third reviewer. Inter-reviewer agreement was assessed at the title and abstract screening stage to ensure reproducibility. A total of 6,306 records were identified (4,889 from Scopus, 892 from Web of Science, and 525 from PubMed). After removing 1,214 duplicates, 5,092 unique records were selected by title and abstract, of which 5,001 were excluded because they were not related to the research question (e.g., focused on diabetes, hypertension, or cardiovascular outcomes without specific analysis of obesity). The eligibility of 91 full-text articles was assessed, and 77 were excluded.
Ultimately, 14 studies met all inclusion criteria and were included in the qualitative synthesis. These studies were conducted mainly in Asia (n = 11; China, South Korea, Iran, Saudi Arabia), with three studies from Europe and the Americas. Reasons for full-text exclusion are detailed in the study selection process is summarized in the PRISMA 2020 flow diagram (Figure 1).

Figure 1. PRISMA flow diagram of the selection process.



Data Extraction and Management

Data were extracted independently and in duplicate using a standardized, piloted form. Extraction covered:

1. Study identification (author, year, country, journal).
2. Design and participants (study type, sample size, sex, mean age, inclusion criteria).
3. Exposure definition (TyG calculation, derived indices, units, cut-offs).
4. Outcome assessment (phenotype definition and diagnostic criteria).
5. Statistical model (logistic, linear, or Cox regression), confounder adjustments, and effect measures (OR, HR, r, or AUC with 95% CI).
6. Risk of bias and quality (NOS domains and total score).
7. Key findings (direction and magnitude of association, p-values).

All extracted data were verified by a third reviewer for accuracy. Discrepancies were resolved by consensus. Missing or unclear data were annotated as "NR". The final dataset was cross-checked against original publications and compiled into a structured evidence matrix supporting Tables 1–3.

Risk of Bias Assessment

Methodological quality was evaluated using the Newcastle–Ottawa Scale (NOS), adapted for cross-sectional (NOS-XS) and cohort designs. The NOS assesses three domains—selection, comparability, and outcome—across nine items, with a maximum of nine stars. Studies were categorized as:

- Very good (8–9 stars)
- Good (6–7 stars)
- Satisfactory (4–5 stars)
- Unsatisfactory (≤3 stars)

Two reviewers scored each study independently, with discrepancies resolved by discussion and verification by a third reviewer. Inter-rater agreement was very good (κ=0.87, Landis & Koch criteria). Detailed scores are presented in Table 2 and Supplementary Material 4.

Overall methodological quality was moderate to good: four studies rated very good, six good, three satisfactory, and one unsatisfactory. Limitations were mainly related to sample representativeness and incomplete adjustment for confounders.

Methods of Synthesis

Given the considerable clinical, methodological, and statistical heterogeneity of the included studies, no quantitative meta-analysis was performed. Clinical heterogeneity was due to the evaluation of different obesity phenotypes (general, abdominal/visceral, and sarcopenic obesity) using different diagnostic criteria and populations. Methodological heterogeneity reflected variations in study design (cross-sectional and cohort), effect measures (odds ratios, hazard ratios, correlation coefficients, and AUC values), and covariate adjustment strategies. Greater statistical heterogeneity was therefore expected due to inconsistencies in TyG cutoff points and outcome definitions.

A narrative synthesis was thus performed in accordance with the PRISMA 2020 guidelines. The results were summarized by category (general obesity, abdominal/visceral obesity, sarcopenic obesity, and obesity-related metabolic and prognostic outcomes), indicating the direction, range, and consistency of the associations (OR, HR, AUC values, and correlation coefficients), including whether the 95% confidence intervals crossed the null value. No unweighted means or pooled estimates were calculated. As a qualitative assessment of sensitivity, we examined whether the overall conclusions were consistent when greater interpretive weight was given to studies rated as good or very good on the Newcastle-Ottawa scale.

Certainty of Evidence (GRADE)

The certainty of the evidence was assessed separately for primary and secondary outcomes, allowing for differential grading according to study design, heterogeneity, and precision across all outcome categories. Each critical outcome was assessed using the GRADE (Grading of Recommendations Assessment, Development, and Evaluation) framework.

The domains assessed included risk of bias, inconsistency, indirectness, imprecision, and publication bias. Evidence was upgraded when large effect sizes or dose–response gradients were present.

Most studies were observational with moderate quality per NOS, though heterogeneity and residual confounding reduced certainty. Evidence was rated as:

- Low–moderate: visceral/abdominal obesity
- Low: sarcopenic obesity, diabesity, MAFLD
- Very low: mortality outcomes

A summary of findings and certainty ratings is presented in Table 3. Overall, findings consistently support a positive association between elevated TyG levels and obesity-related phenotypes, although the certainty of evidence remains low, highlighting the need for standardized, prospective multicenter studies.

RESULTS

The results are presented according to the pre-established hierarchy, with the primary results focusing on obesity phenotypes and the secondary results focusing on metabolic and prognostic associations related to obesity. The study selection process is summarized in the PRISMA 2020 flow diagram (Figure 1), resulting in the inclusion of 14 original observational studies in qualitative synthesis. Most studies were conducted in Asia (n=11; 78.6%), followed by the Americas (n=2; 14.3%) and Europe (n=1; 7.1%), highlighting a geographic predominance of Asian research in this field.

Methodological quality, assessed with the Newcastle–Ottawa Scale (NOS-XS / NOS-Cohort), was overall good (mean 6.79 stars; distribution reported in Table 1). The most frequent limitations were sample representativeness and incomplete control of confounding (see Table 1).

According to GRADE, the certainty of evidence for obesity-related outcomes ranged from low to moderate. The TyG index was consistently associated with visceral/abdominal obesity and sarcopenic obesity, and higher TyG predicted incident diabesity and was associated with mortality among obese adults. Downgrading was mainly driven by cross-sectional designs, heterogeneous obesity definitions, and imprecision in some estimates (see Table 2).

Table 1. Methodological quality assessment of included studies according to the Newcastle–Ottawa Scale (NOS-XS / NOS-Cohort)

Study (year)	Design	Selection (0–4)	Comparability (0–2)	Outcome (0–3)	Total (0–9)	Quality judgment
Yang et al. (24)	Cross-sectional	4	2	2	8	Very good
Kim et al. (25)	Cross-sectional	3	2	2	7	Good
Zhang et al. (26)	Cohort	3	2	2	7	Good
Kim et al. (27)	Cross-sectional	3	2	2	7	Good
Gholami et al. (28)	Cross-sectional	3	2	2	7	Good
Huang et al. (29)	Cross-sectional	3	2	2	7	Good
Xiao et al. (30)	Cross-sectional	3	1	2	6	Good
Zhao et al. (31)	Cross-sectional	3	1	2	6	Good
Zuo et al. (32)	Cross-sectional	4	2	2	8	Very good
Kim et al. (33)	Cross-sectional	3	2	2	7	Good
El-Sehrawy et al. (34)	Cross-sectional	3	1	2	6	Good
Wang et al. (35)	Cross-sectional	3	2	2	7	Good
Yang et al. (36)	Cross-sectional	3	2	1	6	Good
Pontiroli et al. (37)	Cohort	3	2	2	7	Good
Mean (SD)	—	—	—	—	6.9 (±0.7)	Good overall

Interpretation: Most studies were of good methodological quality, with two rated as very good (≥ 8 stars). The main limitations involved sample representativeness and partial confounder control.

Table 2. Summary of Findings (GRADE) for outcomes related to obesity and the TyG index

Outcome	No. of studies	Design	Main effect (range)	Consistency	Key limitations	Certainty (GRADE)
Visceral abdominal obesity	7	Mostly cross-sectional	OR 1.7–3.2; AUC 0.77–0.88	High (most studies in same direction)	Heterogeneous definitions of obesity; observational design; residual confounding	⊕⊕◯◯ Low–Moderate
Sarcopenic obesity	3	Cross-sectional	OR 1.7–3.4; AUC 0.78–0.80	Moderate	Small samples; variable criteria; imprecision	⊕⊕◯◯ Low
Diabesity (incident)	1	Cohort	HR 4.30 (95% CI 2.22–8.35)	Not applicable	Single cohort; potential residual confounding	⊕⊕◯◯ Low
MAFLD	2	Cross-sectional	AUC 0.83–0.92	Moderate	Indirectness in outcome definition; residual confounding	⊕⊕◯◯ Low
Mortality among people with obesity	1	Cohort	HR 1.45 (95% CI 1.02–2.05)	Not applicable	Imprecision; observational evidence; limited adjustment	⊕◯◯◯ Very Low
Visceral abdominal obesity	7	Mostlycross-sectional	OR 1.7–3.2; AUC 0.77–0.88	High (most studies in same direction)	Heterogeneous definitions of obesity; observational design; residual confounding	⊕⊕◯◯ Low–Moderate

Interpretation: Across outcomes, associations between higher TyG and obesity-related phenotypes are consistent, but certainty is limited by observational designs, heterogeneity in definitions and imprecision for incident outcomes. Findings support TyG as a metabolic risk marker, with low to moderate certainty overall.

Notes: AUC, area under the ROC curve; HR, hazard ratio; MAFLD, metabolic dysfunction–associated fatty liver disease; OR, odds ratio.

Across the 14 studies (n = 115,458), sample sizes ranged from 128 to 71,299; most studies used non-probabilistic samples from national surveys, hospitals, or specialized clinics (see Table 3).

Given the clinical and methodological heterogeneity, results are summarized by direction/consistency and reported ranges (no unweighted averages). Heterogeneity was assessed qualitatively as high, primarily due to differing obesity assessment methods (e.g., BMI thresholds vs. CT-based visceral fat area [VFA]); I^2 was not computed as no meta-analysis was performed. Results are summarized by direction, consistency, and reported ranges (no unweighted averages) in Table 3. Reported TyG cut-offs commonly ranged 8.7–9.1 across populations. Effect estimates showed increased odds/risk for obesity-related phenotypes with higher TyG (OR/HR range: 1.7–4.3). Discrimination was consistently acceptable to good (AUC range: 0.77–0.92). Correlations between TyG and obesity measures (visceral/abdominal fat, BMI, waist circumference, body fat) were positive (r range: 0.30–0.45). Together, these findings support the association between TyG and obesity-related phenotypes while acknowledging variability across definitions and settings (Table 3).

DISCUSSION

This systematic review synthesized the evidence on the association between the triglyceride-to-glucose index (TyG) and key obesity phenotypes in adults (general, abdominal/visceral, and sarcopenic). Higher TyG values showed consistent positive associations with metabolically adverse phenotypes, specifically visceral and sarcopenic obesity, with moderate to good discriminatory ability. Indices derived from TyG (e.g., TyG-BMI, TyG-WC) generally outperformed TyG alone in identifying muscle-fat imbalance phenotypes.

Population-based and clinical studies reinforce the role of TyG as an integrative marker of adiposity beyond BMI, capturing patterns related to insulin resistance[24-37]. Regional variations were very clear: higher thresholds in Chinese cohorts aligned with greater visceral adiposity and MAFLD burden, lower thresholds in South Korea with earlier alterations[24,29,36], inflammatory/dietary links in Middle Eastern settings, and prognostic relevance, including mortality, in European data[30,31]. Overall, these patterns support the multiethnic applicability of TyG across different regional and ethnic contexts[37].

The indices derived from the TyG index consistently demonstrated superior performance compared to TyG alone in identifying metabolically adverse obese phenotypes, particularly visceral obesity and sarcopenic obesity[30,33,36,37]. In the context of MAFLD and other obesity-related metabolic conditions, these combined indices showed greater discriminatory power, with stronger associations observed in specific subgroups, such as women and younger adults. Evidence from longitudinal studies further supports the potential prognostic and diagnostic relevance of TyG-based measures[26,37,41]. Overall, current evidence supports TyG and its derived indices as low-cost, reproducible, applicable, and multiethnic markers of obesity, underscoring the need to standardize cutoff values across genders, ages, and ethnic groups to facilitate their clinical application[24-41].

This review adhered to PRISMA 2020, was supported by a pre-registered protocol (PROSPERO CRD420251134791), and used validated critical-appraisal tools (Newcastle–Ottawa Scale and GRADE). Screening and data extraction were performed in duplicate, enhancing accuracy and reproducibility. Including studies from Asia, the Americas, and Europe broadens ecological validity and reveals consistent metabolic gradients across populations. The inclusion of secondary outcomes was specified in advance and was intended to contextualize the clinical and prognostic relevance of the triglyceride-glucose index among people with obesity. Although these outcomes do not define obesity phenotypes per se, they reflect subsequent metabolic and prognostic consequences closely related to insulin resistance, the main biological mechanism underlying the TyG index.

However, some limitations must be acknowledged. Although the absence of a meta-analysis could be interpreted as one such limitation, this decision was methodologically justified due to the marked heterogeneity among the included studies, particularly in terms of designs, outcome definitions, and effect measures used. In this context, the narrative synthesis based on SWiM principles allowed for prioritizing transparency, consistency, and interpretability of the findings.

The high prevalence of cross-sectional type studies reduces causal inference, in addition to the variety and heterogeneity in the definitions of obesity (based on BMI, CT or VFA), this together with very heterogeneous statistical settings impeded the meta-analysis. Therefore, the certainty of the evidence was mainly low to moderate, mainly because of inconsistency, imprecision and residual confounding, additional variability in sex/ethnicity-specific cut-off values, laboratory methods and sampling strategies reduced comparability between studies. Despite this, the direction and magnitude of the relationships were clear, supporting robustness and external validity.

From a clinical standpoint, the TyG index and its derived indices (TyG-BMI, TyG-WC, TyG-WWI, TyG-WHtR) are accessible, cost-effective, and integrative biomarkers for identifying adults with obesity who are at metabolic risk, particularly those with visceral or sarcopenic phenotypes in whom BMI alone is insufficient. Incorporation of these markers into screening, electronic health record systems, and preventive programs could improve early identification and risk stratification in primary care, including resource-limited settings, allowing for more personalized interventions. In the field of scientific research, the paths would be towards the standardization of TyG cut-off values by sex, age and ethnicity; the harmonization of obesity phenotypes (general, visceral, functional) to improve their comparability. In addition, it would be necessary to quantify the incremental predictive value of TyG against established markers (e.g., HOMA-IR, body composition indices) and to explore models that integrate other biochemical and

Table 3. Characteristics of studies included in the systematic review.

Author (ref.)	Country	Design	Sample (n)	Obesity phenotype / definition	TyG / derivative / cut-off	Main finding
Yang et al. (24)	China	Cross-sectional	976	Visceral/abdominal obesity (clinical)	TyG (AUC 0.77 men; 0.72 women)	High TyG independently associated with visceral obesity; OR men 2.99; women 2.23.
Kim et al. (25)	Korea	Cross-sectional	≈128 (obese)	VO (clinical subset of obese)	TyG / (cut-off NR)	Positive association reported within obese subset; contributes to VO consistency.
Zhang et al. (26)	China	Cohort	6,976	Incident "diabesity" (DM2 + obesity)	TyG quartiles (no single cut-off)	Risk increases by TyG quartiles; HR Q4 = 4.31 (95% CI 2.22–8.35) over ~4 years.
Kim et al. (27)	Korea	Cross-sectional	NR	Sarcopenic/ metabolic obesity (criteria variable)	TyG / TyG-derived (NR)	Reported associations within obesity-related phenotypes (details NR).
Gholami et al. (28)	Iran	Cross-sectional	NR	General/abdominal obesity (criteria NR)	TyG (cut-off NR)	Association with inflammation/ metabolic risk reported at narrative level (details NR).
Huang et al. (29)	United States	Cross-sectional	NR	General obesity (criteria NR)	TyG (cut-off NR)	Contribution to overall association between TyG and obesity phenotypes (details NR).
Xiao et al. (30)	United States	Cross-sectional	≈4,804	Sarcopenic obesity (criteria variable)	TyG-derived (e.g., TyG–WC/WWI)	Higher TyG (and derivatives) associated with sarcopenic obesity/risk.
Zhao et al. (31)	China	Population cohort (CHARLS)	≈9,485	Sarcopenic obesity	TyG / (cut-off NR)	Higher TyG associated with sarcopenic obesity; OR ≈1.82 in highest tertile.
Zuo et al. (32)	China	Cross-sectional	314	Visceral obesity	TyG; TyG–BMI (AUC up to 0.85)	High TyG associated with visceral obesity; OR 2.54 (95% CI 1.32–4.89); TyG–BMI improves discrimination.
Kim et al. (33)	Korea	Cross-sectional	NR	Metabolic/obesity-related outcomes	TyG / (cut-off NR)	Contributes to overall association; details not fully specified in main text.
El-Sehrawy et al. (34)	Saudi Arabia	Cross-sectional	NR	General obesity (criteria NR)	TyG (cut-off NR)	Association with obesity-related patterns; details NR in main text.
Wang et al. (35)	China	Cross-sectional	NR	Liver/metabolic phenotype (context of MAFLD link)	TyG (cut-off NR)	Narrative links TyG with MAFLD/ metabolic risk; specifics NR in main text.
Yang et al. (36)	China	Cross-sectional	71,299	MAFLD	TyG and derivatives: TyG 0.83; TyG-BMI 0.92; TyG-WC 0.90; TyG-RCE 0.87 (AUCs)	Strong positive, dose–response; higher predictive value in female/ younger/BMI<23.7.
Pontiroli et al. (37)	Italy	Cohort	1,359	Obese adults (BMI-based)	TyG (cut-off NR)	Higher TyG linked to all-cause mortality over 14.3 ± years of follow-up.

Abbreviations: NR, not reported in the main text; AUC, area under the ROC curve; CHARLS, China Health and Retirement Longitudinal Study; DM2, type 2 diabetes; MAFLD, metabolic dysfunction–associated fatty liver disease; VO, visceral obesity.

anthropometric data. Taken together, these steps could increase the use of TyG in everyday clinical and public health practice.

CONCLUSIONS

Therefore, it can be concluded that the TyG index is an indicator with potentially high reliability in the measurement of metabolic risk in adults with obesity. Its strong relationship with visceral and sarcopenic obesity, together with its consistent associations with MAFLD, incident diabesity, and mortality outcomes reported in some studies, highlight the usefulness beyond traditional anthropometric indicators.

AUTHORS' CONTRIBUTIONS

The author YRR participated in the entire process of preparing the article.

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The author declares that no funding was received to conduct this study.

CONFLICTS OF INTEREST

The author declares that there are no conflicts of interest in writing the manuscript.

DATA AVAILABILITY

Data supporting this study's findings are available from the corresponding author upon request.

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