1

Revista Española de Nutrición Humana y Dietética
Spanish Journal of Human Nutrition and Dietetics

RESEARCH ARTICLE – SUPPLEMENTARY MATERIAL

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

Yury Rosales-Ricardo[a*]

[a]Universidad Tecnológica del Perú, Lima, Perú.

*rosalesricardoyury@gmail.com

Supplementary Material 1
Deviations from the Registered Protocol (PROSPERO)

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

PROSPERO registration number: CRD420251134791

Registration date: 29 August 2025

Protocol record:
https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD420251134791

Protocol adherence

The protocol for this systematic review was prospectively registered in the PROSPERO database prior to the conduct of the review. The review followed the methodological framework described in the registered protocol and adhered to the recommendations of PRISMA 2020.

The predefined elements of the protocol, including the research question, study design eligibility, screening procedures, data extraction process, and risk-of-bias assessment using the Newcastle–Ottawa Scale, were maintained during the conduct of the review.

However, several methodological clarifications and adjustments were introduced during the review process. These changes are transparently reported below to ensure reproducibility and methodological transparency.

Deviations and clarifications relative to the registered protocol

1. Search timeframe

The PROSPERO record indicates that database searches were planned between 30 August 2025 and 30 September 2025.

PROSPERO

In the final review, the search strategy was designed to capture studies published during the previous five years, covering the period 1 January 2020 to 31 July 2025, with database searches executed on 1 August 2025.

This modification was introduced to ensure comprehensive coverage of the most recent literature prior to manuscript preparation. The adjustment does not alter the research objective or eligibility criteria but reflects the final operational search strategy used in the review.

2. Population definition

The registered protocol specified inclusion of adults aged 18 to 59 years.

PROSPERO

During the review process, the population criterion was expanded to include all adults aged ≥18 years, without an upper age limit. This modification allowed the inclusion of studies involving older adult populations, which were relevant for outcomes such as sarcopenic obesity and other age-related obesity phenotypes.

This adjustment broadened the population scope but remained consistent with the overall objective of evaluating the association between the triglyceride–glucose index and obesity in adults.

3. Exposure indicators

The protocol focused on the triglyceride–glucose (TyG) index as the primary exposure variable.
PROSPERO
During the review, several included studies reported TyG-derived indices (e.g., TyG-BMI, TyG-WC, TyG-WHtR, and TyG-WWI). These indicators were incorporated into the analysis as related exposure measures derived from the TyG index.
This inclusion did not modify the central exposure concept but expanded the analytical framework to reflect variations used in the published literature.

4. Outcomes analyzed

The protocol described TyG in relation to obesity outcomes but did not specify additional metabolic outcomes.
PROSPERO
In the final review, some studies also reported obesity-related metabolic outcomes (e.g., metabolic dysfunction–associated fatty liver disease and related metabolic risk conditions). These outcomes were reported descriptively as part of the broader context of obesity-related metabolic risk.

5. Certainty of evidence assessment

The PROSPERO record states that certainty of findings would not be assessed.
PROSPERO
In the final review, the certainty of evidence was evaluated using the GRADE framework. This methodological addition was introduced to strengthen the interpretation of the evidence and improve the transparency of the results.

6. Databases searched

The PROSPERO record lists MEDLINE, PubMed, SCI, SSCI, and Scopus as planned sources.
PROSPERO
In practice, the electronic searches were performed in:

- PubMed/MEDLINE
- Scopus
- Web of Science Core Collection

The Web of Science Core Collection includes the SCI and SSCI indexes, which are consistent with the sources specified in the protocol.

Overall assessment

Despite the clarifications described above, the fundamental aspects of the protocol, including the research objective, observational study design, screening procedures, risk-of-bias assessment using the Newcastle–Ottawa Scale, and narrative synthesis strategy, remained consistent with the registered protocol.
The deviations reported here reflect operational adjustments made during the conduct of the review and do not affect the overall validity or interpretation of the findings.

Supplementary Material 2
Complete Search Strategies

Databases searched
The literature search was conducted in the following databases:
- PubMed/MEDLINE
- Scopus
- Web of Science Core Collection

Search period: The search covered studies published between 1 January 2020 and 31 July 2025.
Date of search execution: All database searches were executed on 1 August 2025.
Language restrictions: Studies published in English or Spanish were considered eligible.
Study design restriction: The search strategy was designed to retrieve observational studies, excluding secondary literature such as narrative reviews, systematic reviews, and meta-analyses.

PubMed (MEDLINE)
Search query:
("triglyceride glucose index"[Title/Abstract] OR "triglyceride-glucose index"[Title/Abstract] OR "TyG index"[Title/Abstract] OR "TyG"[Title/Abstract]) AND ("obesity"[MeSH Terms] OR "obesity"[Title/Abstract] OR "overweight"[Title/Abstract] OR "abdominal obesity"[Title/Abstract] OR "visceral adiposity"[Title/Abstract] OR "sarcopenic obesity"[Title/Abstract] OR "metabolic dysfunction associated fatty liver disease"[Title/Abstract] OR "MAFLD"[Title/Abstract]) NOT (review[Publication Type] OR meta-analysis[Publication Type])
Filters: Publication date from 2020/01/01 to 2025/07/31; Humans; English; Spanish

Scopus
Search query:
TITLE-ABS-KEY
("triglyceride glucose index" OR "triglyceride-glucose index" OR "TyG index" OR "TyG") AND TITLE-ABS-KEY
("obesity" OR "overweight" OR "abdominal obesity" OR "visceral adiposity" OR "sarcopenic obesity" OR "MAFLD") AND PUBYEAR > 2019 AND (LIMIT-TO (LANGUAGE, "English") OR LIMIT-TO (LANGUAGE, "Spanish")) AND NOT TITLE-ABS-KEY ("review" OR "meta-analysis")

Web of Science Core Collection
Search query:
TS = (("triglyceride glucose index" OR "triglyceride-glucose index" OR "TyG index" OR "TyG") AND ("obesity" OR "overweight" OR "abdominal obesity" OR "visceral adiposity" OR "sarcopenic obesity" OR "MAFLD"))
Refined by:
Document Types = Article
Languages = English OR Spanish
Timespan = 2020–2025
Indexes = SCI-EXPANDED, SSCI, ESCI

Additional search procedures

Reference lists of included studies and relevant articles were manually screened to identify additional potentially eligible studies not captured through the electronic database searches.

Reproducibility statement

The search strategies presented above reflect the database queries used during the systematic review process. These strategies allow independent researchers to reproduce the search and verify the results reported in this review.

Supplementary Material 3

PRISMA 2020 Checklist

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

This checklist follows the recommendations of the PRISMA 2020.

Section and Topic	Item	PRISMA Item Description	Location in Manuscript
Title	1	Identify the report as a systematic review	Title
Abstract	2	Structured summary of the review	Abstract
Introduction	3	Describe the rationale for the review	Introduction
Introduction	4	Provide explicit statement of objectives	Introduction
Methods	5	Specify inclusion and exclusion criteria	Methods – Eligibility criteria
Methods	6	Specify information sources	Methods – Information sources
Methods	7	Present full search strategies	Supplementary Material 2
Methods	8	Describe study selection process	Methods – Study selection
Methods	9	Describe data collection process	Methods – Data extraction
Methods	10	Define outcomes and variables	Methods – Eligibility criteria and data extraction
Methods	11	Describe risk-of-bias assessment	Methods – Risk of bias assessment
Methods	12	Describe effect measures	Methods – Methods of synthesis
Methods	13	Describe synthesis methods	Methods – Methods of synthesis
Methods	14	Reporting bias assessment	Not applicable (no meta-analysis performed)
Methods	15	Certainty of evidence assessment	Methods – GRADE
Results	16	Study selection results	Results and Figure 1
Results	17	Characteristics of included studies	Table 3
Results	18	Risk-of-bias results	Table 1
Results	19	Results of individual studies	Results
Results	20	Results of synthesis	Results
Results	21	Reporting bias results	Not applicable (no meta-analysis performed)
Results	22	Certainty of evidence	Table 2
Discussion	23	General interpretation of results	Discussion
Discussion	24	Limitations of evidence	Discussion
Discussion	25	Implications for practice and research	Discussion
Other information	26	Registration and protocol	Methods
Other information	27	Funding	Funding statement
Other information	28	Competing interests	Conflict of interest
Other information	29	Availability of data and materials	Data availability statement

Supplementary Material 4
Detailed risk-of-bias assessment using the Newcastle–Ottawa Scale (NOS)

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

Risk-of-bias assessment method: The methodological quality of the included studies was assessed using the Newcastle–Ottawa Scale.

For cross-sectional and cohort studies, the adapted NOS evaluates three domains:

- Selection (0–4 stars)
- Comparability (0–2 stars)
- Outcome (0–3 stars)

The maximum score is 9 stars, with higher scores indicating higher methodological quality.

Two reviewers independently assessed each study. Disagreements were resolved through discussion and verification by a third reviewer.

Quality interpretation followed commonly used thresholds:

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

Detailed NOS scoring for each included study

Study	Design	Selection (0–4)	Comparability (0–2)	Outcome (0–3)	Total score	Quality rating
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

Summary of methodological quality

According to the included studies, the mean NOS score was 6.9 ± 0.7, indicating overall good methodological quality. Two studies were rated as very good, while the remaining studies were classified as good quality.

The most common limitations identified were:

- limited representativeness of some study samples
- partial adjustment for potential confounding variables

Despite these limitations, the overall methodological quality of the evidence base was considered acceptable for the objectives of the systematic review.

Reproducibility statement

The NOS scoring presented in this supplementary material corresponds directly to the quality assessment summarized in Table 1 of the main manuscript. Independent verification can be performed by applying the Newcastle–Ottawa Scale criteria to the original studies included in the review.