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Non-alcoholic Beverage Consumption and the Risk of Depression, Anxiety and Stress: A Systematic Review and Meta-analysis

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ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - Data extraction.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 20 November 2025 and was last updated on 20 November 2025.

INTRODUCTION

Review question / Objective What is the association between non-alcoholic beverage consumption and the risk of depression, anxiety, and stress?

Condition being studied The health conditions of interest are depression, anxiety, and stress, which are major contributors to the global burden of disease. This meta-analysis investigates their association with the consumption of non-alcoholic beverages—a modifiable dietary exposure with growing global consumption. We aim to synthesize the inconsistent evidence and evaluate whether these associations differ across specific non-alcoholic beverages types and population subgroups.

METHODS

Search strategy We conducted a systematic search of four electronic databases (PubMed, Web of Science, PsycINFO, EMBASE) from inception to November 19, 2024, to identify studies examining the association between non-alcoholic beverage consumption and depression, anxiety, and stress. The primary search terms were based on "non-alcoholic beverages," "depression," "anxiety," and "stress." For "non-alcoholic beverages," we used the following terms: "coffee," "tea," "green tea," "black tea," "beverages," "beverage," "soft drink," "carbonated Beverages." For "depression," we utilized terms such as "depress*," "depression," "depressive," "depressed," "depressive symptom," "emotional depression," "depression disorder," "depression risk." For "anxiety," we employed the following search terms: "anxiety," "anxiety*," "anxieties." The search term for "stress" was "stress*".

Participant or population General population (adults and/or adolescents).

Intervention Non-alcoholic beverage consumption assessed in ≥2 quantitative categories.

Comparator The lowest consumption category or non-consumers.

Study designs to be included Cross-sectional or prospective cohort studies.

Eligibility criteria The exclusion criteria included (1) studies not reporting effect sizes or where effect sizes could not be converted to OR/RR/HR; (2) studies examining mixed alcoholic and non-alcoholic beverages without separable data; (3) duplicate database records from the same cohort wave; (4) studies already confirmed by Mendelian randomization evidence regarding tea and depression relationships; (5) studies focusing exclusively on pregnant or lactating women.

Information sources PubMed, Web of Science, PsycINFO, and EMBASE.

Main outcome(s) The association between non-alcoholic beverage consumption and risk of depression, anxiety,stress (i.e., OR, RR, or HR).

Quality assessment / Risk of bias analysis For cross-sectional studies, we utilized the 11-item checklist recommended by the Agency for Healthcare Research and Quality (AHRQ) to evaluate the methodological quality of the included studies. Each item was scored "0" for responses of "NO" or "UNCLEAR" and "1" for "YES". The quality assessment criteria were as follows: low quality = 0-3 points; moderate quality = 4-7 points; high quality = 8-11 points.
Regarding cohort studies, we employed the Newcastle-Ottawa Scale (NOS) to assess the quality of the included studies. The NOS comprises three domains with a total of nine items: selection (0-4 points), comparability (0-2 points), and exposure (0-3 points). In the "selection" and "exposure" categories, each item could earn up to one star, while the "comparability" category could earn up to two stars. Based on the total scores, studies were classified into three quality categories: 0-3 as low quality; 4-6 as moderate quality; and 7-9 as high quality.

Strategy of data synthesis We extracted adjusted ORs from the original studies. Fixed-effect or random-effects models were employed to calculate pooled ORs and 95% confidence intervals (CIs) for the associations between non-alcoholic beverages and depression, anxiety, and stress. Heterogeneity was assessed using the I^2 statistic. A random-effects model was employed when I^2 exceeded 50%, indicating substantial heterogeneity; otherwise, a fixed-effect model was used. All statistical analyses in this study were performed using R software (version 4.3.3) with the "meta" and "forestplot" packages, with two-tailed P-value < 0.05 considered statistically significant for all tests.

Subgroup analysis Sample size was dichotomized using a median split, based on thresholds established in prior research. Subgroup analyses were conducted based on the following categorical variables: income levels and geographical regions from the World Bank (https://data.worldbank.org/country), sample size, age distribution, COVID-19 period, and type of non-alcoholic beverage. Additionally, sex-specific estimates reported separately in the original studies were extracted and meta-analyzed independently to elucidate potential sex differences. Meta-regression analyses were conducted for continuous variables, including the proportion of male participants and the study quality score, if applicable.

Sensitivity analysis Sensitivity analysis was performed by examining the reliability of results after excluding each study, one by one, if applicable.

Country(ies) involved China.

Keywords Non-alcoholic beverages; Depression; Anxiety; Stress; Meta-analysis.

Contributions of each author

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