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Diagnostic accuracy of screening tests for eating disorders in adolescents and adults in primary health care: protocol for systematic review and meta-analysis

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ABSTRACT

Introduction Eating disorders can be irreversible and, in many cases, fatal. However, the symptoms full recovery is possible, and early diagnosis is one, of many, important factors for the success of treatment. In this sense, the screening of risk behaviours arises as a relevant alternative to improve the prognosis of patients. This review will analyse the diagnostic accuracy of self-administered screening tests for eating disorders in adolescent and adult users of primary healthcare.

Methods and analysis A systematic review will be performed by independent reviewers. The databases used will be Medline, Embase, the Latin American and Caribbean Health Sciences Literature, the Cumulative Index to Nursing and Allied Health Literature, Web of Science, PsycINFO, ProQuest Dissertations and Theses Database and Google Scholar without restrictions on the year of publication and language. Studies that compared the results of self-administered screening tests for eating disorders in adolescents and adults in primary care with the results of clinical interviews will be included. Data extraction will consist of the identification of the publication, study and participant characteristics, general information about the tools and data on the diagnostic accuracy properties. The risk of bias in the studies will be assessed via the Quality Assessment of Diagnostic Accuracy Studies. Qualitative data will be presented in narrative form. The meta-analysis will be conducted via the random effects model with the metadata command of Stata. The summary statistics for sensitivity and specificity, as well as their 95% CI, will be generated.

Ethics and dissemination This systematic review is based on published literature; therefore, submission to an ethics committee is not necessary. The dissemination of the study will be carried out through technical reports, scientific articles, posters, meeting presentations, specific forums, national congresses and international media.

PROSPERO registration number CRD42023476156.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Our protocol follows the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols.
⇒ The search will be carried out in eight electronic databases, including grey literature, in addition to article reference lists and consultation with experts, which increases retention of non-indexed articles.
⇒ We will include eligible studies conducted in any country, without geographical limits, without restrictions based on the year of publication and language, which allows greater generalisation of the analysis.
⇒ We will include studies conducted among different populations and using different evaluation tools, which may limit the performance of meta-analysis depending on the number of articles retained.
⇒ Subgroup analysis will be considered whenever possible.

BACKGROUND

Eating disorders (EDs) are psychiatric diseases that have a significant impact on the eating behaviour and overall health of people who experience them.[1] They are characterised by obsessive and persistent thoughts about food and calories and patterns of severe restriction or excessive consumption, in addition to constant concern and dissatisfaction with weight, shape and body image.[2] The clinical complications of EDs are severe and can lead to fatal consequences, either by worsening the disease or by increasing the risk of suicide.[3]

In recent years, EDs have become a growing public health concern. Between 2000–2006 and 2013–2018, the global prevalence increased by approximately 123%.[4] Higher rates of binge eating disorder (BED), bulimia nervosa (BN) and anorexia nervosa (AN) are reported in adolescent and young adult women.[4 5] However, these disorders affect a wide variety of groups at the global level, surpassing the barriers of age, gender, culture, socioeconomic status, body size and weight.[6]

The complications of EDs vary significantly between adolescents and adults, although they share some common features. In adolescents, vulnerability to physical complications such as malnutrition and weight loss, if untreated, increases the risk of permanent osteopenia and osteoporosis.[6 7] In contrast, adults with ED often face more serious complications, such as fractures associated with osteoporosis, in addition to having more prevalent purging behaviours, which increases the risk of electrolyte and metabolic disorders. In addition, ED in this adult age group is strongly associated with metabolic comorbidities, including diabetes, hypertension and high cholesterol and triglyceride levels.[7]

The psychosocial repercussions of ED also vary according to age. In adolescents, EDs impact psychosocial development, intensifying social isolation and hindering adjustment in a crucial transition phase.[6 7] For adults, ED significantly compromises psychosocial functioning and quality of life, with a more notable impact on interpersonal relationships. In adolescents, a potentially lower neurobiological and social impact is observed, possibly due to the higher levels of psychiatric comorbidities than in adults.[7] In the context of brain changes, adolescents may exhibit a slight reduction in grey matter that persists even after weight regain, while in adults, these changes are more often reversed with prolonged weight maintenance.[7] These distinctions reinforce the need for screening methods adapted to each age group, improving diagnostic accuracy and facilitating more effective interventions.

The detection of the risk of ED, performed with screening tests, can decrease the duration of the disease and reduce negative outcomes such as disability and high mortality rates, especially due to malnutrition and suicide.[3] Primary healthcare (PHC) is a favourable environment for early diagnosis. People with ED do not seek psychiatric care as a first alternative but tend to seek primary care settings frequently for other reasons.[8]

Thus, PHC professionals are in a favourable position for the early detection of the risk of EDs given the regularity with which the patient presents themselves in this environment and the trust relationship between the professional and the patient.[9] In this scenario, effective screening for ED is essential, but it is important to ensure that the tests are appropriate for detecting the risk of a full range of ED. Therefore, verification of the diagnostic accuracy of these tests is essential.

The scientific literature presents studies that address the diagnostic accuracy of screening tests for ED on different fronts. A systematic review published on the subject synthesised data from the USA, limiting the evaluation of screening tests translated into other languages and cultures.[10] A previous meta-analysis evaluated the diagnostic efficacy of the Sick Control One Stone Fat Food Questionnaire (SCOFF) for the detection of ED in eight different countries and in seven different languages. This generalisation was positive, as it allowed the comparison and synthesis of results in different countries and languages. However, the limitations of this study include its use of a single screening tool, SCOFF.[11]

Given the need for early diagnosis of ED to reduce disease prolongation and negative outcomes, verification of the diagnostic accuracy of screening tests will guide future choices about which test will best be applied in PHC. This review aims to verify the diagnostic accuracy of self-administered screening tests for EDs used in adolescents and adults in the PHC in comparison with the reference standard of clinical interviews.

METHODS AND ANALYSIS

Study design

This is a protocol for a systematic review of diagnostic accuracy with meta-analysis developed according to the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses-Protocol (PRISMA-P)[12] and checklist (online supplemental appendix 1). The protocol was registered in PROSPERO under number CRD42023476156 on 8 November 2023.

The review will follow the acronym PIRO. Population: adolescent (10 to 18 years old) and adult (18 to 65 years old) users of PHC or generalisable primary care settings, regardless of gender, race, ethnicity and geographical location, who underwent screening tests for ED; Index test: validated or no validated tests self-administered screening tests to screen the risk of ED on the basis of symptoms; Reference standard: structured or semistructured clinical interview on the basis of the diagnostic criteria of the DSM-5 or ICD or other mental illness classification system; Outcome: accuracy of self-administered screening tests for AN, BN and BED.

Eligibility criteria

Cohort, cross-sectional and case-control studies that have compared the results of self-administered screening tools for ED with the results of clinical interviews are considered the gold standard. This comparison should allow the preparation of a 2×2 contingency table, detailing the test results classified as true positive (TP), false positive (FP), true negative (TN) and false negative (FN).

Studies with participants who do not fit the age group of interest will be excluded; studies with data reported by parents; studies in clinical populations undergoing treatment for ED; and studies with pregnant or lactating adolescents, children and elderly individuals. Studies that analysed the reference standard only in the subgroup that screened positive for ED in the index test will not be considered yet. Studies conducted in settings outside the scope of PHC, for example, bariatric surgery centres or hospitals, outpatient clinics, communities or schools not linked to PHC will be excluded.

Information sources and search strategy

The search was performed by reviewer (TSDO) in the following databases: Medline (PubMed), Embase (Elsevier), Latin American and Caribbean Health Sciences

Literature, Cumulative Index to Nursing and Allied Health Literature, Web of Science and PsycINFO. Additionally, grey literature will be searched in the ProQuest Dissertations and Theses Database and Google Scholar. A manual search of the reference lists of studies included in the review or relevant reviews identified during the selection phases and consultations with experts in the field will be performed in order to retrieve studies that have not been retained by the search in the databases. Limits of date, language or country/region will not be imposed on the search, nor will any search filter. The search strategy was initially designed via Medline (PubMed) and then adjusted to the other databases. Online supplemental appendix 2 presents the complete search strategy for all eight databases. The search in the database began on 19 October 2023, and the entire review process is expected to be completed on 30 December 2024.

Study selection

To assist in conducting the systematic review, we will use Covidence review software, developed by Veritas Health Innovation, Melbourne, Australia (available at www.covidence.org). All the articles captured in the search will be exported to Covidence, where duplicates will be removed. Two independent reviewers (TSDO and EMP) will select the articles in two stages. First, the titles and abstracts will be read. Articles that meet the eligibility criteria will be read in full in the second stage. Those with confirmed eligibility criteria will be included in the review, and the others will be excluded. Inconsistencies in the classification of decisions will be discussed with a third reviewer (PRFC) and documented. The PRISMA flowchart will be automatically generated by Covidence, which will present the total number of articles found in the search, those excluded after screening with their respective reasons for exclusion and those included in the study.

Data extraction and data items

The extraction of data from the included studies after triage will be performed in Covidence review software by two reviewers (TSDO and KBBS) independently, and discrepancies will be resolved by a third reviewer (VAOQ). The studies will be read in full again, and then data collection will begin, which will include identification of the publication, characteristics of the study and participants, and general information about the tools and data on the diagnostic accuracy properties, as shown in table 1.

If the necessary information is not clear in the studies, the team will contact the authors (maximum of three attempts by email) to request the missing data. The entire process will be documented and filed. Multiple articles from the same study will be identified by the name of the authors, city and location of the study, specific details of the study methodology, date and duration of the study and excluded. If doubts remain, the authors of the articles will be contacted.

Outcome assessment

The outcome of interest is the accuracy of the self-administered screening tests for AN, BN and BED presented through performance measures: sensitivity, specificity, positive predictive values (PPV), negative predictive values (NPV), positive and negative likelihood ratios and ORs of diagnosis.

Risk of bias assessment strategy

The evaluation of methodological quality will be performed only for studies included in the systematic review. Therefore, a revised version of the Quality Assessment of Diagnostic Accuracy Studies (QUADAS- 2)[13] will be used because it is appropriate for assessing quality and is divided into 'risk of bias' and 'concerns regarding applicability'. This evaluation will be conducted independently by two reviewers and disagreements will be discussed and resolved in a consensus meeting with a third reviewer.

The results will be presented through narrative descriptions, tables demonstrating each aspect of the methodological quality for each individual study, a global evaluation of the set of studies and 'traffic light' graphs generated with Review Manager software.[14]

Table 1 Information collection

Publication identification	Title of the article, author's name, year of publication, journal, volume/page, DOI (PMID), conflicts of interest
Study characteristics	Country, region, study objective, study design, study context, sample size, calculation of sample size, loss of sample patients, recruitment period, recruitment method
Characteristics of the participants	Inclusion criteria, exclusion criteria, health status, mean/median age, gender, race/colour/nationality, weight, height, mean BMI, education, socioeconomic status, marital status
General information about the tools and data on the diagnostic accuracy properties	Investigated eating disorder, reference standard (SR), responsible for applying the RS, index test (IT), validation of the index test, language of the index test, number of items evaluated in the index test, cultural adaptation of the index test, sensitivity, specificity, PPV, NPV, area under the ROC curve, TP, FP, TN, FN, sample percentage of risk of ED, limitations and potential of the study or test, usefulness in PHC

FN, false negative; FP, false positive; NPV, negative predictive values; PPV, positive predictive values; TN, true negative; TP, true positive.

Analysis, data synthesis, publication bias and reporting

Qualitative data will be presented in narrative form to summarise and explain the results stratified for AN, BN and BED. For combinable studies,[15 16] quantitative data syntheses will be performed via meta-analysis. The extent of meta-analysis heterogeneity will be tested via the Cochran Q test and quantified via the inconsistency test (I^2 statistic). A p value is often cited as an indication of the extent of variability between studies. Thus, the χ^2 test will be used to assess the significance of heterogeneity. For this purpose, a significance level of $p<0.10$ will be used to detect the true heterogeneity between the results of the studies.[15 16]

The magnitude of heterogeneity will be identified by calculating the I^2, which ranges from 0% to 100%. Thus, an I^2 close to zero suggests that all dispersion can be attributed to the random error of the study; that is, there is no heterogeneity. If an I^2 value close to 25% is calculated, it indicates low heterogeneity between studies; if it is greater than 50%, it indicates moderate heterogeneity; and if it is greater than 75%, it indicates high heterogeneity.[15 16]

In the presence of high heterogeneity, a meta-analysis will be performed via the random effects model conducted with the *metadata* command of *Stata*. Data from diagnostic test studies usually result from a 2×2 cross-tabulation of the results of an index test versus the reference standard. The data in the four cells represent the TP, FP, TN and FN. The sum of TP and FN is the total with the outcome, and the sum of TN and FP is the total without the outcome. The *metadata* command requires five variables to run, which include TP, FP, TN, FN and the study identifier. Thus, the summary statistics sensitivity and specificity will be generated, as well as their respective 95% CI will be generated and presented in Forest plot figures.

Potential variables that may influence the high heterogeneity between studies will be investigated through subgroup analysis (for dichotomous variables: age group, ethnicity and socioeconomic status) and meta-regression (for continuous variables: mean age, sample size and mean BMI). If 10 or more studies are included in the meta-analysis, the Egger test and the *funnel plot* will be used to assess publication bias.

Patient and public involvement

Patients and/or the public were not involved.

ETHICS AND DISSEMINATION

Approval from the ethics committee was not requested because the data collected and analysed will be obtained from primary studies, with no link to specific people.

The transfer of study results will be performed through technical reports with project data, with the goal of disseminating the results to managers and health professionals to the academic community through scientific articles, presentations at meetings, specific forums, local events and/or national and/or international events. In addition, infographics will be prepared with simple and direct language of the main results to be disseminated on social networks (the Instagram profile of the School of Nutrition of UFBa and the Eating Behaviour and Health research group), and a press release will be issued if deemed necessary. The research report will be published in printed and/or electronic versions and presented at a meeting with the Department of Science and Technology of the Department of Science, Technology, Innovation and Strategic Inputs in Health of the Ministry of Health (Decit/SCTIE/MS).

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Contributors MLPS conceived the original idea for this systematic review. TSDO and MLPS drafted the manuscript. TSDO designed the search strategy. MLPS and PRFC revised the search strategy. MLPS and PRFC provided content expertise on eating disorders in adolescents and adults and diagnostic test accuracy. All authors (TSDO, MLPS, VAOQ, KBBS, PCM, EMP, PRFC) read, critically reviewed, provided feedback and approved the final manuscript. MLPS is the guarantor of the review. All authors agreed to publish this protocol and to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

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REFERENCES

1 APA- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders (DSM-5)*. 5th edn. Arlington, VA: American Psychiatric Publishing, 2013.
2 NIMH-National Institute of Mental Health. *Eating Disorders*. U.S. Department of Health and Human Services, National Institutes of Health, 2023.
3 Golden NH, Katzman DK, Sawyer SM, *et al*. Position Paper of the Society for Adolescent Health and Medicine: medical management of restrictive eating disorders in adolescents and young adults. *J Adolesc Health* 2015;56:121–5.
4 Galmiche M, Déchelotte P, Lambert G, *et al*. Prevalence of eating disorders over the 2000-2018 period: a systematic literature review. *Am J Clin Nutr* 2019;109:1402–13.
5 Silén Y, Keski-Rahkonen A. Worldwide prevalence of DSM-5 eating disorders among young people. *Curr Opin Psychiatry* 2022;35:362–71.

6 Chew KK, Temples HS. Adolescent Eating Disorders: Early Identification and Management in Primary Care. *J Pediatr Health Care* 2022;147:618–27.
7 Dalle Grave R, Sartirana M, Sermattei S, *et al*. Treatment of Eating Disorders in Adults Versus Adolescents: Similarities and Differences. *Clin Ther* 2021;43:70–84.
8 Bryant E, Miskovic-Wheatley J, Touyz S, *et al*. Transitioning to digital first line intervention – validation of a brief online screener for early identification of a suspected eating disorder: study protocol. *J Eat Disord* 2020;8.
9 Sweeney C. Screening for eating disorders in children and adolescents in primary health care, ID ref: 3963. 2017.
10 Feltner C, Peat C, Reddy S, *et al*. Screening for Eating Disorders in Adolescents and Adults: Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA* 2022;327:1068–82.
11 Botella J, Sepúlveda AR, Huang H, *et al*. A meta-analysis of the diagnostic accuracy of the SCOFF. *Span J Psychol* 2013;16:E92.
12 Moher D, Shamseer L, Clarke M, *et al*. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev* 2015;4:1.
13 Whiting PF, Rutjes AWS, Westwood ME, *et al*. QUADAS-2: a revised tool for the quality assessment of diagnostic accuracy studies. *Ann Intern Med* 2011;155:529–36.
14 RevMan Web - Review Manager Web. Version (version number). The Cochrane Collaboration, (version date). n.d. Available: https://revman.cochrane.org/
15 Higgins J, Thomas J. Manual Cochrane para revisões sistemáticas de intervenções-Treinamento Cochrane. Disponível em. Available: https://training.cochrane.org/handbook/current [Accessed 4 Jul 2021].
16 Deeks JJ, Higgins JPT, Altman DG. Chapter 10: analyzing data and undertaking meta-analyses. In: Higgins JPT, Thomas J, Chandler J, et al, eds. *Cochrane handbook for systematic reviews of interventions version 6.0*. Cochrane, 2019.