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Anxiety and Other Psychological Outcomes in Patients with Pectus Excavatum: A Systematic Review

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ADMINISTRATIVE INFORMATION

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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 6 August 2026 and was last updated on 6 August 2026.

INTRODUCTION

Review question / Objective The objective of this systematic review is to comprehensively evaluate the available evidence on anxiety and other psychological outcomes among individuals with pectus excavatum. Specifically, the review aims to characterize the prevalence and spectrum of anxiety-related manifestations, summarize the assessment tools used to evaluate psychological status, and synthesize evidence regarding associated outcomes, including depression, body image, self-esteem, self-efficacy, psychological distress, and health-related quality of life. In addition, the review seeks to examine changes in psychological outcomes following surgical correction of pectus excavatum, when reported, and to critically appraise the methodological quality of the available literature.

Rationale Pectus excavatum is the most prevalent congenital deformity of the anterior chest wall and has traditionally been considered a condition with predominantly cosmetic or structural implications. However, an increasing number of clinical studies suggest that its impact extends to psychological well-being, with anxiety emerging as one of the most frequently reported manifestations. In addition to anxiety, patients with pectus excavatum have been described as experiencing depression, impaired body image, reduced self-esteem, diminished self-efficacy, psychological distress, and poorer health-related quality of life. Despite the growing body of literature, the available evidence remains fragmented because studies differ substantially in design, patient characteristics, timing of assessment, treatment status, and psychological instruments employed. Consequently, the overall prevalence and spectrum of anxiety-related manifestations, as well as their relationship with other psychological outcomes, have not been systematically synthesized. This review has been designed to provide a comprehensive and methodologically rigorous summary of the available evidence, identify current knowledge gaps, and support future research and

multidisciplinary clinical management of patients with pectus excavatum.

Condition being studied The condition of interest is pectus excavatum, a congenital anterior chest wall deformity characterized by posterior displacement of the sternum with variable thoracic depression. The review focuses on the psychological burden associated with this condition, particularly anxiety and anxiety-related manifestations, while also considering other relevant patient-reported psychological outcomes, including depressive symptoms, body image dissatisfaction, self-esteem, self-efficacy, psychological distress, and health-related quality of life. Both untreated individuals and patients undergoing surgical correction of pectus excavatum will be considered to provide a comprehensive overview of psychological outcomes across different clinical settings.

METHODS

Search strategy A comprehensive electronic literature search will be conducted in PubMed/MEDLINE, Scopus, and EMBASE from database inception to July 2026 without restrictions on publication year or geographic location. Search strategies will combine controlled vocabulary terms, when available, with free-text keywords related to pectus excavatum and psychological outcomes. The search will include terms referring to anxiety, anxiety disorders, social anxiety, panic disorder, depression, psychological distress, mental health, body image, self-esteem, self-efficacy, quality of life, and surgical correction of pectus excavatum. Boolean operators ("AND" and "OR") will be applied to optimize retrieval of relevant studies. In addition, the reference lists of all eligible articles and pertinent review papers will be manually screened to identify further studies not captured through the electronic database search. The literature search, study selection, and eligibility assessment will be performed independently by two reviewers, with disagreements resolved through discussion until consensus is reached.

Participant or population The review will include children, adolescents, and adults with a clinical diagnosis of pectus excavatum, irrespective of sex, ethnicity, or geographic region. Eligible participants may be untreated or have undergone surgical correction, including minimally invasive or open repair techniques. Studies enrolling mixed chest wall deformity populations will be considered only if data for patients with pectus excavatum can be extracted separately or if this group represents the predominant study population.

Intervention No specific intervention is required for study eligibility. The review includes both untreated individuals with pectus excavatum and patients who have undergone surgical correction, including minimally invasive repair of pectus excavatum (MIRPE/Nuss procedure) and open repair techniques (e.g., modified Ravitch procedure). Studies assessing psychological outcomes before surgery, after surgery, or during longitudinal follow-up will all be considered eligible, provided that anxiety or other relevant psychological outcomes are evaluated.

Comparator No single comparator is required for study inclusion. Depending on the study design, eligible comparisons may include healthy individuals or the general population, patients assessed before versus after surgical correction, or comparisons between different pectus excavatum subgroups (e.g., according to disease severity, treatment status, or psychological characteristics). Studies without a comparator group will also be considered eligible if they report anxiety or other psychological outcomes in patients with pectus excavatum using validated assessment methods.

Study designs to be included Original clinical studies of any observational or interventional design will be eligible for inclusion. These may include prospective or retrospective cohort studies, cross-sectional studies, case–control studies, longitudinal observational investigations, and randomized or non-randomized interventional studies evaluating psychological outcomes in patients with pectus excavatum. Studies published as full-text articles in peer-reviewed journals will be considered. Case reports, case series, conference abstracts, editorials, letters, narrative reviews, systematic reviews, meta-analyses, expert o.

Eligibility criteria Studies will be considered eligible if they include children, adolescents, or adults with a clinical diagnosis of pectus excavatum and evaluate anxiety or other psychological outcomes using validated psychometric instruments, standardized diagnostic criteria, or clearly described assessment methods. Both observational and interventional studies will be eligible, regardless of treatment status, including untreated patients and those undergoing surgical correction. Additional psychological domains, such as depressive symptoms, body image, self-esteem, self-efficacy, psychological distress, and health-related quality of life, will be considered when reported alongside anxiety-

related outcomes. No restrictions will be applied regarding sex, ethnicity, country, or clinical setting. Studies enrolling mixed populations with different chest wall deformities will be included only if data for patients with pectus excavatum are reported separately or if this group constitutes the majority of the study cohort. Editorials, narrative reviews, systematic reviews, meta-analyses, conference abstracts, case reports, letters, expert opinions, clinical practice guidelines, and animal or experimental studies will be excluded.

Information sources The literature search will be performed using three electronic bibliographic databases: PubMed/MEDLINE, Scopus, and EMBASE. Database searches will cover all records available from inception through July 2026. To maximize study identification, the reference lists of all eligible publications and relevant review articles will also be manually examined for additional studies that may not have been retrieved through the electronic search. Only studies published as full-text articles in peer-reviewed journals will be considered for inclusion.

Main outcome(s) The primary outcome will be the occurrence and characteristics of anxiety-related manifestations in individuals with pectus excavatum. This will include the prevalence of clinically significant anxiety or anxiety disorders, as well as anxiety severity measured by validated psychometric instruments or standardized diagnostic criteria. When available, data on state anxiety, trait anxiety, social anxiety, anxiety sensitivity, perioperative anxiety, and other anxiety-related constructs will also be extracted and qualitatively synthesized.

Additional outcome(s) Secondary outcomes will include other patient-reported psychological measures associated with pectus excavatum, including depressive symptoms, global psychological distress, body image perception, self-esteem, self-efficacy, and health-related quality of life. When available, the review will also summarize changes in these outcomes following surgical correction, together with the psychometric instruments adopted, the timing of psychological assessment, and factors potentially associated with psychological well-being, such as demographic characteristics, deformity severity, and treatment status.

Data management All records identified through the literature search will be imported into reference management software, where duplicate citations will be identified and removed before screening. Two reviewers will independently screen titles, abstracts, and full-text articles according to the predefined eligibility criteria. Data from eligible studies will be extracted using a standardized data collection form specifically developed for this review. Extracted information will include study characteristics, participant demographics, clinical features, psychological assessment methods, and reported outcomes. Following extraction, the datasets will be independently cross-checked for completeness and accuracy. Any discrepancies arising during study selection or data extraction will be resolved through discussion and consensus, with consultation of a third reviewer if necessary.

Quality assessment / Risk of bias analysis The methodological quality of the included studies will be independently evaluated by two reviewers using the National Institutes of Health (NIH) Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies. Each study will be appraised across the applicable methodological domains, including study objectives, participant selection, outcome assessment, confounding, and statistical methodology, and will subsequently be categorized as having good, fair, or poor methodological quality according to the overall assessment. Any disagreements between reviewers will be resolved through discussion until consensus is achieved, with consultation of a third reviewer if required. The results of the quality assessment will be summarized descriptively and considered when interpreting the overall strength and reliability of the available evidence.

Strategy of data synthesis A qualitative synthesis of the included studies will be undertaken. Study characteristics, participant demographics, clinical variables, psychological assessment methods, and reported outcomes will be summarized using descriptive tables and narrative analysis. When at least two independent studies report sufficiently comparable variables using the same definitions and psychometric instruments, sample size-weighted descriptive estimates will be calculated for selected demographic, clinical, and psychological outcomes. Because substantial heterogeneity is anticipated with respect to study design, participant characteristics, timing of assessment, psychological instruments, and outcome definitions, a quantitative meta-analysis of effect estimates is not planned. The findings will therefore be presented as a structured narrative synthesis supported by weighted descriptive summaries, with particular attention to the consistency of results across studies and the identification of methodological gaps requiring further investigation.

Subgroup analysis A qualitative synthesis of the included studies will be undertaken. Study characteristics, participant demographics, clinical variables, psychological assessment methods, and reported outcomes will be summarized using descriptive tables and narrative analysis. When at least two independent studies report sufficiently comparable variables using the same definitions and psychometric instruments, sample size-weighted descriptive estimates will be calculated for selected demographic, clinical, and psychological outcomes. Because substantial heterogeneity is anticipated with respect to study design, participant characteristics, timing of assessment, psychological instruments, and outcome definitions, a quantitative meta-analysis of effect estimates is not planned. The findings will therefore be presented as a structured narrative synthesis supported by weighted descriptive summaries, with particular attention to the consistency of results across studies and the identification of methodological gaps requiring further investigation.

Sensitivity analysis No formal sensitivity analyses are planned because a quantitative meta-analysis will not be performed. The robustness of the findings will instead be considered through a critical appraisal of the methodological quality of the included studies and by examining the consistency of results across studies with different designs, populations, and psychological assessment methods. Any potential influence of studies judged to be of lower methodological quality will be discussed narratively during the interpretation of the evidence.

Language restriction No language restrictions will be applied during the literature search. Studies published in any language will be considered for inclusion, provided that sufficient information is available to assess eligibility and.

Country(ies) involved Italy.

Keywords Pectus excavatum; anxiety; anxiety disorders; psychological outcomes; depression; body image; self-esteem; health-related quality of life; mental health; systematic review.

Dissemination plans The findings of this systematic review will be disseminated through publication in a peer-reviewed international scientific journal and may also be presented at relevant national and international scientific meetings. The review is intended to contribute to the evidence base supporting the multidisciplinary assessment and management of patients with pectus excavatum.

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