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Effect of Mental Health Comorbidities on Adult Spinal Deformity Outcomes: A Systematic Review and Meta-Analysis

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ADMINISTRATIVE INFORMATION

Support - N/A.

Review Stage at time of this submission - Data extraction.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202560113

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 28 June 2025 and was last updated on 28 June 2025.

INTRODUCTION

R eview question / Objective To determine if preoperative mental health comorbidities are associated with poor surgical outcomes for adult spinal deformity (ASD).

Rationale

Adult Spinal Deformity (ASD) is pathologic malalignment of the spine and can result in significant loss of quality of life, loss of function, and morbidity.¹ Significantly, untreated ASD can often result in high rates of mental health comorbidities such as depression and self-image issues due to the deforming nature of these conditions.² Additionally, prolonged and chronic loss of function may also negatively affect mental health.³

Surgical intervention is highly effective method of treating ASD, resulting in improved quality of life and function for many. However, there has been increasing levels of evidence highlighting the significant role of preoperative mental health comorbidities in predicting post operative outcomes in both the cervical and lumbar spine populations.^{4,5} Significantly, the role of mental health comorbidities in the ASD population, which may be disproportionately enriched in mental health comorbidities, has been suggested by several studies.⁶⁻⁸ However, to our knowledge, no systematic review and meta-analysis has been conducted to ascertain the effects of pre-operative mental health comorbidities on surgical outcomes in patients with ASD.

We seek to perform a systematic review of the literature for any prospective, retrospective, or RCT studies that investigated the effect of preoperative mental health comorbidities, including but not limited to overall measures of mental health, depression, anxiety, bipolar, and PTSD, on surgical outcomes for ASD and to perform a metaanalysis of these results. In doing so, we hope to better understand the true effect of mental health comorbidities on ASD surgical outcomes.

Condition being studied

ASD is a common pathology that is associated with significant loss of quality of life and function. Surgical interventions for the correction of these deformities are highly effective and commonly performed. However, the role that mental health comorbidities play in outcomes remain unclear.

METHODS

Search Strategy

Medline/Pubmed:

("Mental Disorders"[Mesh] OR "Mental Health"[Mesh] OR "Depression"[Mesh] OR "Anxiety Disorders"[Mesh]

OR "Bipolar Disorder" [Mesh] OR "Stress Disorders, Post-Traumatic" [Mesh] OR "Obsessive-Compulsive Disorder" [Mesh]

OR "Schizophrenia"[Mesh] OR "Substance-Related Disorders"[Mesh] OR "Personality Disorders"[Mesh]

OR "Somatoform Disorders"[Mesh] OR depression[tiab] OR depressive[tiab] OR "major depressive disorder"[tiab]

OR anxiety[tiab] OR "generalized anxiety disorder"[tiab] OR "panic disorder"[tiab]

OR "post-traumatic stress disorder"[tiab] OR PTSD[tiab] OR bipolar[tiab] OR "bipolar disorder"[tiab]

OR "mood disorder"[tiab] OR schizophrenia[tiab] OR psychosis[tiab] OR "psychotic disorder"[tiab]

OR "substance use disorder"[tiab] OR "alcohol use disorder"[tiab] OR "drug use disorder"[tiab]

OR "eating disorder"[tiab] OR "anorexia nervosa"[tiab] OR "bulimia nervosa"[tiab]

OR "personality disorder"[tiab] OR "adjustment disorder"[tiab] OR "somatic symptom disorder"[tiab]

OR "conversion disorder"[tiab] OR "obsessive-compulsive disorder"[tiab] OR OCD[tiab]

OR "psychological distress"[tiab] OR "mental illness"[tiab] OR "psychiatric disorder"[tiab])

AND

("Spinal Curvatures"[Mesh] OR "Scoliosis"[Mesh] OR "Kyphosis"[Mesh]

OR scoliosis[tiab] OR kyphosis[tiab] OR "adult spinal deformity"[tiab]

OR "thoracolumbar deformity"[tiab] OR "sagittal imbalance"[tiab]

OR "spinal malalignment"[tiab] OR "spinal deformity"[tiab])

N=1371

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Embase Search Terms:

('depression' OR 'anxiety disorder' OR 'bipolar disorder' OR 'posttraumatic stress disorder' OR 'obsessive compulsive disorder' OR 'schizophrenia' OR depression:ti,ab OR depressive:ti,ab OR 'major depressive disorder':ti,ab OR anxiety:ti,ab OR 'generalized anxiety disorder':ti,ab OR 'panic disorder':ti,ab OR 'post-traumatic stress disorder':ti,ab OR ptsd:ti,ab OR bipolar:ti,ab OR 'bipolar disorder':ti,ab OR schizophrenia:ti,ab) AND ('scoliosis' OR 'kyphosis' OR scoliosis:ti,ab OR kyphosis:ti,ab OR 'adult spinal deformity':ti,ab OR 'thoracolumbar deformity':ti,ab OR 'sagittal imbalance':ti,ab OR 'spinal malalignment':ti,ab OR 'spinal deformity':ti,ab)

N=1486

Web of Science Search Terms:

TS=(depression OR depressive OR "major depressive disorder"

OR anxiety OR "generalized anxiety disorder" OR "panic disorder"

OR "post-traumatic stress disorder" OR PTSD OR bipolar OR "bipolar disorder"

OR "mood disorder" OR schizophrenia OR psychosis OR "psychotic disorder"

OR "substance use disorder" OR "alcohol use disorder" OR "drug use disorder"

OR "eating disorder" OR "anorexia nervosa" OR "bulimia nervosa"

OR "personality disorder" OR "adjustment disorder" OR "somatic symptom disorder"

OR "conversion disorder" OR "obsessive compulsive disorder" OR OCD

OR "psychological distress" OR "mental illness" OR "psychiatric disorder"

OR "mental health")

AND

TS=("spinal curvature" OR scoliosis OR kyphosis

OR "adult spinal deformity" OR "thoracolumbar deformity"

OR "sagittal imbalance" OR "spinal malalignment" OR "spinal deformity")

N=2174

Scopus:

(TITLE-ABS-KEY(depression) OR TITLE-ABS-KEY(depressive) OR TITLE-ABS-KEY("major depressive disorder")

OR TITLE-ABS-KEY(anxiety) OR TITLE-ABS-KEY("generalized anxiety disorder") OR TITLE-ABS-KEY("panic disorder")

OR TITLE-ABS-KEY("post-traumatic stress disorder") OR TITLE-ABS-KEY(PTSD) OR TITLE-ABS-KEY(bipolar)

OR TITLE-ABS-KEY("bipolar disorder") OR TITLE-ABS-KEY("mood disorder") OR TITLE-ABS-KEY(schizophrenia) OR TITLE-ABS-KEY(psychosis) OR TITLE-ABS-KEY("psychotic disorder") OR TITLE-ABS-KEY("substance use disorder")

OR TITLE-ABS-KEY("alcohol use disorder") OR TITLE-ABS-KEY("drug use disorder")

OR TITLE-ABS-KEY("eating disorder") OR TITLE-ABS-KEY("anorexia nervosa")

OR TITLE-ABS-KEY("bulimia nervosa") OR TITLE-ABS-KEY("personality disorder")

OR TITLE-ABS-KEY("adjustment disorder") OR TITLE-ABS-KEY("somatic symptom disorder")

OR TITLE-ABS-KEY("conversion disorder") OR TITLE-ABS-KEY("obsessive compulsive disorder")

OR TITLE-ABS-KEY(OCD) OR TITLE-ABS-KEY("psychological distress")

OR TITLE-ABS-KEY("mental illness") OR TITLE-ABS-KEY("psychiatric disorder")

OR TITLE-ABS-KEY("mental health")) AND

(TITLE-ABS-KEY("spinal curvature") OR TITLE-ABS-KEY("scoliosis") OR TITLE-ABS-KEY("kyphosis")

OR TITLE-ABS-KEY("adult spinal deformity") OR TITLE-ABS-KEY("thoracolumbar deformity")

OR TITLE-ABS-KEY("sagittal imbalance") OR TITLE-ABS-KEY("spinal malalignment")

OR TITLE-ABS-KEY("spinal deformity")) N=916

Participant or population

Adult patients (>18) with adult spinal deformity and underwent surgical treatment.

Intervention

Pre-operative mental health comorbidities.

Comparator

Patients with preoperative mental health comorbidities compared to those without.

Study designs to be included

Observational studies, RCTs.

Eligibility criteria

Study exclusion criteria:

Case reports, pilot reports, opinion pieces, theses, conference proceedings, letters, editorials, metaanalysis, reviews, surgical technique papers, abstracts, presentations, and non-english language publications without translation.

Information sources

Medline, Embase, Web of Science, Scopus.

Main outcome(s)

Odds Ratio for Complications Odds Ratio for Readmissions Change in PROs after operation

Additional outcome(s)

Any complications.

Data management

Articles selected will be stored in Covidence for screening of studies. Data extraction will be conducted via a standardized spreadsheet.⁹ Selection process:

Two independent reviewers will assess remaining articles for relevance first based on titles and abstracts, and then will assess full-text articles for eligibility. Any disagreements between reviewers will be resolved in both phases by either consensus or by a third reviewer. Each selected study will be distributed to one of the authors for extraction. We anticipate no effort needed to contact authors of selected studies to obtain patient level data.

Quality assessment / Risk of bias analysis

Risk of bias will be determined for each study via the ROBINS-I tool.¹⁰ Study quality will be assessed with the Newcastle-Ottowa scale. Competing interests in each study will be noted if any author had ties to industry particularly those funded by an industry sponsor.

Strategy of data synthesis

We expect variability in patient selection among the studies. Therefore, we plan on using a randomeffects model with restricted maximum-likelihood estimation to perform the meta-analysis. We will utilize standardized mean difference (SMD) and raw mean differences (RMD) for pooled analysis of continuous outcome variables. We plan on using an inconsistency index (I2) to assess for heterogeneity. We will also be calculating the mean difference in survival between treatment groups. Meta-regression will be conducted to identify contributors to overall heterogeneity. All statistical analyses were performed using R (version 4.3.1).11 Packages utilized will include the meta package.¹² Alpha will be set at 0.05 and all test of significance will be 2-sided. Data and syntax used for the analysis will be made publicly available through GitHub.

Subgroup analysis

Separations based on method of determining mental health burden, specific morbidity if relevant

Sensitivity analysis

We will perform a sensitivity analysis via the leaveone-out method. Statistical heterogeneity and the magnitude of heterogeneity will be assessed using Cochran χ^2 tests and the I2 statistic, respectively. Publication bias will be assessed using the Egger test and visually using funnel plots.

Language restriction English.

Country(ies) involved North American, European, Asia.

Other relevant information N/A

Keywords

ASD, Spinal Deformity, Mental Health, Depression, Anxiety

Dissemination plans

Publication in peer-reviewed journal

Contributions of each author

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References

- 1 Diebo, B. G. et al. Adult spinal deformity. The Lancet 394, 160-172 (2019).
- 2 Ames, C. P. et al. Adult Spinal Deformity: Epidemiology, Health Impact, Evaluation,

and Management. Spine Deformity 4, 310-322, doi:https://doi.org/10.1016/j.jspd.2015.12.009 (2016).

3 Hartman, T. J. et al. Correlation of mental health with physical function, pain, and disability following anterior lumbar interbody fusion. Acta Neurochirurgica 165, 341-349 (2023).

4 Javeed, S. et al. Influence of Preoperative Depression on Cervical Spine Surgery Outcomes: A Systematic Review and Meta-Analysis. Global Spine J, 2 1 9 2 5 6 8 2 2 5 1 3 1 6 2 4 5 , doi:10.1177/21925682251316245 (2025).

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Javeed, S. et al. Implications of Preoperative Depression for Lumbar Spine Surgery Outcomes: A Systematic Review and Meta-Analysis. JAMA Network Open 7, e2348565-e2348565, doi:10.1001/ jamanetworkopen.2023.48565 (2024).

Bakhsheshian, J. et al. Impact of poor mental health in adult spinal deformity patients with poor physical function: a retrospective analysis with a 2-year followup. Journal of Neurosurgery: Spine SPI 26, 116-124, doi:https://doi.org/ 10.3171/2016.5.SPINE151428 (2017).

Theologis, A. A. et al. Impact of preoperative depression on 2-year clinical outcomes following adult spinal deformity surgery: the importance of risk stratification based on type of psychological distress. Journal of Neurosurgery: Spine SPI 25, 477-485, d o i : h t t p s : / / d o i . o r g / 10.3171/2016.2.SPINE15980 (2016).

8 Agarwal, N. et al. What is the effect of preoperative depression on outcomes after minimally invasive surgery for adult spinal deformity? A prospective cohort analysis. Journal of Neurosurgery: Spine 40, 602-610, doi:https://doi.org/ 10.3171/2023.12.SPINE221330 (2024).

9 Babineau, J. Product review: Covidence (systematic review software). Journal of the Canadian Health Libraries Association/ Journal de l'Association des bibliothèques de la santé du Canada 35, 68-71 (2014).

10 Sterne, J. A. et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. BMJ 355, i4919, doi:10.1136/bmj.i4919 (2016).

11 Team, R. C. R: A Language and Environment for Statistical Computing. (Vienna, Austria, 2022).

12 Schwarzer, G. meta: An R package for meta-analysis. R news 7, 40-45 (2007).