



## Literature Review

# Prevalence of Psychopathology in Bariatric Surgical Candidates with Type 2 Diabetes Mellitus: Systematic Review

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## Abstract

**Introduction:** Bariatric surgical candidates confer an elevated risk of psychopathology. Prior reviews highlight the vulnerability and bidirectionality of psychopathology in people with Type 2 Diabetes Mellitus (T2DM). Despite this, current evidence for the rates of psychopathology in people with T2DM pre and post-bariatric surgery has yet to be systematically reviewed.

**Objective:** To perform a systematic review of the prevalence of psychopathology in adults with Type 2 Diabetes Mellitus pre and post-bariatric surgery.

**Results:** Seven studies fulfilled the inclusion criteria, from 45,576 studies on the digital search of databases.

**Conclusions:** Scant evidence exists which specifies cohorts of bariatric surgical patients with T2DM and rates of psychopathology. Further research is warranted to understand the risks, measures, and potential interventions for this subgroup.

## Introduction

Type 2 Diabetes Mellitus (T2DM) is a common and debilitating condition, with emerging research into potential treatments including bariatric surgery [1]. Randomized controlled trials have found bariatric surgery improves glycemic control and reduces cardiovascular risk factors for people with T2DM [1]. Despite this, there exists a subgroup of general bariatric patients who are vulnerable to poor outcomes [2]. For instance, an elevated suicide rate has been consistently found for people who undergo bariatric surgery, compared to the general population at a meta-analysis level [3] and documented in longitudinal studies (Tindle, et al. 2010). Studies found that preoperative risk factors such as psychiatric disorder history and sleep difficulties can be important predictors of suicide and non-suicidal self-injury (including disordered eating) behavior [4]. In addition to the risk of death by suicide, eating disorders are also considered poor outcomes for bariatric surgical patients [5]. Post-operative disordered

eating including loss of control of eating and grazing has been found to be associated with poorer excess percent weight loss and increased distress [5]. Preoperative grazing, in addition to higher baseline BMI, has been found to predict variance in excess percent weight loss post-surgery [5].

Previous studies investigating the preoperative risks for poor postoperative outcomes have investigated what psychopathological markers might be predictive of poor course (Martin-Fernandez, et al. 2019). Studies in clinical cohorts of baseline bariatric surgical patients document high rates of psychopathology including eating disorders [6], anxiety-related disorders [7], mood disorders [8], personality disorders [4] and alcohol and substance-related disorders [9]. One recent study, for example, observed that 48% of bariatric surgical candidates met current criteria for psychiatric diagnosis and 78% of a lifetime diagnosis [10]. However, despite the emerging literature on prevalence in general candidates, there exists a lack of consistent definition of psychopathology, consistent

measurements (e.g. clinician interview, type of self-report questionnaire), and inconsistent findings on how predictive these are on a course of treatment. Despite the inconsistencies, international guidelines recommend routine screening of psychopathology at a pre-surgical appointment in order for early identification and treatment [11].

Bariatric surgical candidates are therefore at elevated risk of a current psychiatric condition and screening appears clinically beneficial. For patients with T2DM seeking bariatric surgery for glycemic control, however, the psychological risks are poorly understood. Specific psychological concerns have been documented in people with T2DM such as adherence to medication, glycemic control, and depressive symptoms [12]. Executive functioning and memory deficits in people with T2DM, impacted by psychopathology may impact a candidate's ability to process and retain surgical education material and therefore adherence to medical and dietary advice [13].

At the time of this review, there is scant evidence on the prevalence of psychopathology in people with T2DM seeking bariatric surgery. People with T2DM more broadly are known to be at elevated risk of psychopathology and disordered eating [14]. A recent umbrella review identified 32 systematic reviews with 245 primary studies of people with T2DM and measures of psychopathology [14]. They revealed the high prevalence rates of psychopathology for people with T2DM: 40% sleep disorder, 21% binge eating disorder, 16 % substance use disorder, 14% anxiety-related disorder, 11% bipolar disorder, 11% psychosis, 9% depression [14]. Bi-directional relationships have also been established between psychiatric conditions and T2DM, with many recognized as common comorbidities [14]. Psychopathology has been demonstrated to impact poorly on health outcomes for people with T2DM including poor self-management and sub-optimal glycemic outcomes [15].

Little is known about the course of psychopathology in people with T2DM undergoing bariatric surgery, and current evidence for this has not been systematically reviewed. Systematic reviews have previously investigated bariatric candidates more broadly however a proliferation of studies have been published in the last decade on general candidates. In this background, the current research project aims to investigate the prevalence of psychopathology in people with T2DM before and after bariatric surgery. Specific secondary objectives were related to what type of measurements were utilized to screen people with T2DM (e.g. clinician interviews, self-report questionnaires) for psychopathology and at what time points.

## Methods

### Search protocol

In June 2022 electronic databases (PubMed, Cochrane, PsycINFO, CINAHL, EMBASE, and MEDLINE) were systematically reviewed using the search strategy *psychopathology AND type 2 diabetes AND bariatric surgery*. Please see appendix A for the search strategy used for PubMed and

B for the amended strategy used for the other databases. The study protocol was submitted for registration on PROSPERO. No language or date restrictions were used. Backward and forward searches of seminal articles were also completed. A direct search of obesity surgery journals was also applied. Methods were applied according to the PRISMA statement [16].

### Inclusion criteria

The following lists the inclusion criteria: adult patients ( $\geq 18$ ) with a BMI of  $\geq 35$  kg/m, diagnosed with Type 2 Diabetes Mellitus (T2DM), who have been referred to a type of bariatric surgical treatment including Roux-en-Y gastric bypass (RYGB), sleeve gastrectomy (SG), or biliopancreatic diversion (BPD), and the BPD with duodenal switch (BPD-DS) for obesity. Included studies were original studies only or reviews including original studies. This included randomized controlled trials, quasi-experimental studies, and observational studies (including cohort and case-control studies).

The outcome was defined as a measure of psychopathology (e.g. self-report, clinician interview) or diagnosis of psychopathology (e.g. Binge Eating Disorder, Major Depressive Disorder), frequency (e.g. lifetime or current), and reported as prevalence (%).

### Data abstraction and validity assessment

Studies underwent initial extraction for the title and abstract screening and relevant studies were retrieved for detailed review. Initial extraction involved listing and describing the title, author, sample size and country, measures, whether they specified Type 2 Diabetes Mellitus, and search terms.

Quality assessment utilized Cochrane tools: In randomized trials the RoB 2 tool to assess quality (<https://methods.cochrane.org/risk-bias-2>). For the non-randomized trials, the ROBINS-I tool was used to assess the risk of bias (<https://methods.cochrane.org/bias/risk-bias-non-randomized-studies-interventions>) <https://methods.cochrane.org/bias/risk-bias-non-randomized-studies-interventions>) Appendix C.

An electronic search was performed by two authors. Disagreements were discussed and if unresolved, harmonized by the third author. Figure 1 illustrates the PRISMA selection process.

## Results

### Search results

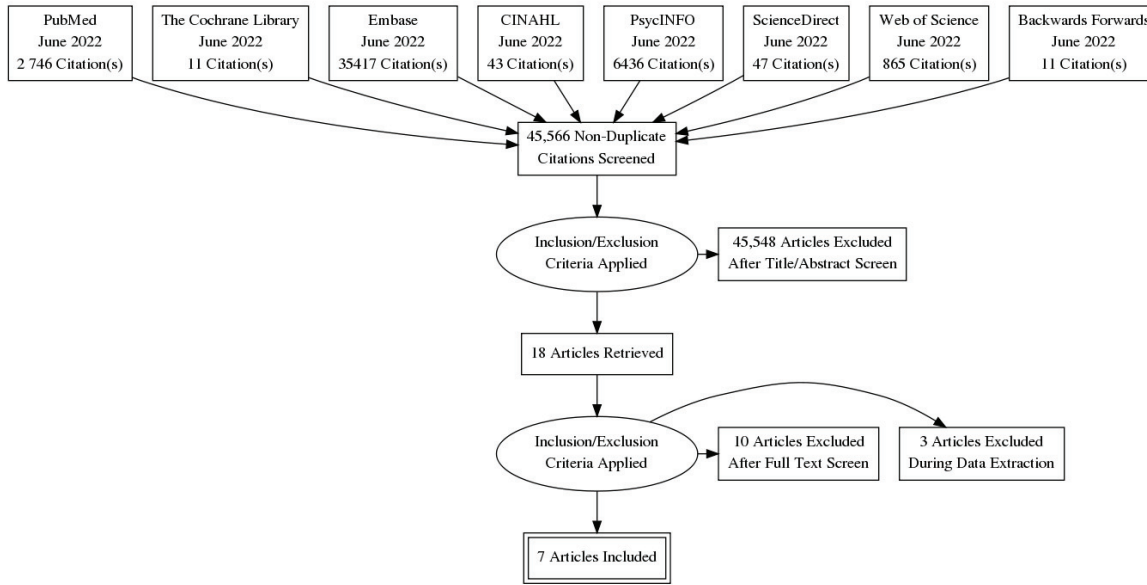
The search strategy revealed 45,576 titles (Figure 1). Title and abstract screening revealed 89 studies. The full-text review revealed that 83 studies met the criteria. Eighteen papers specified T2DM and bariatric surgery (Table 1 outlines the characteristics). Of these, only seven specified psychopathologies in a T2DM sample with a value of prevalence of psychopathology e.g frequency (as outlined in the protocol). Table 2 displays the measures employed to measure psychopathology.



PRISMA Flow Diagram Generator

Prevalence of Psychopathology Before and After Bariatric Surgery

Here is your PRISMA Flow diagram. Below the image is a link for you to download all of the relevant files - whichever output formats you specified, the log file (usually blank) and the .dot file, which is what the dot command of the graphviz tools used to generate your diagram.



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Figure 1: PRISMA diagram.

Table 1: Study characteristics of the papers considered for review.

Author	Year	Sample	Characteristics	Measure	Link
Mitchell, et al.	2015	595 T2DM; 1875 BED, 350 no BED in pre-bariatric surgery American sample <sup>a</sup>	34% (114) BED and T2DM. Compared to 1206 (675) without diabetes and without BED, and 221 (66%) who had BED but did not have T2DM.	QEWPR <sup>c</sup>	<a href="https://pubmed.ncbi.nlm.nih.gov/25778499/">https://pubmed.ncbi.nlm.nih.gov/25778499/</a>
Barbuti, et al.	2021	69 pre-bariatric surgery Italian sample	Mood disorders were found to be more prevalent pre-surgery for people with medical comorbidities (including T2DM, and hypertension OSAS) seeking bariatric surgery.	MINI <sup>c</sup>	<a href="https://pubmed.ncbi.nlm.nih.gov/33038699/">https://pubmed.ncbi.nlm.nih.gov/33038699/</a>
Susmallian, et al.	2019	37 (12%) diabetes from 300 patients pre LSG <sup>b</sup>	21.69% were diagnosed with diabetes and depression.	N/A	<a href="https://pubmed.ncbi.nlm.nih.gov/31454382/">https://pubmed.ncbi.nlm.nih.gov/31454382/</a>
Webb, et al.	2011	488 bariatric surgical candidates in an American sample	8.2% T2DM and BED.	QEWPR-R <sup>c</sup> , Clinical interview using DSM-IV-TR criteria	A comparative analysis of Type 2 diabetes and binge eating disorder in a bariatric sample - ScienceDirect
Wimmelmannel al	2015	129 bariatric surgical candidates	Compared to control, people with T2DM had higher physical QOL. No significant differences in NEO-FFI.	NEO-PI-R <sup>c</sup>	<a href="https://www.sciencedirect.com/science/article/abs/pii/S1550728914002251">https://www.sciencedirect.com/science/article/abs/pii/S1550728914002251</a>
Alosco, et al.	2015	64 diabetes in the pre-bariatric sample (control group N =3)	No significant difference in MDD between those who did and did not have diabetes	SCID-I <sup>c</sup>	Pre-operative history of depression and cognitive changes in bariatric surgery patients-Web of Science Core Collection (uq.edu.au)
Lavender, et al.	2014	15 of 68 T2DM.	20.8% BED and T2DM. Independent samples t-tests and chi-square analyses showed no significant group differences between those with and without a history of BED in terms of T2DM	SCID – DSV – IV <sup>c</sup>	Association between binge eating disorder and changes in cognitive functioning following bariatric surgery-Web of Science Core Collection (uq.edu.au)

<sup>a</sup>LABS: Longitudinal Assessment of Bariatric Surgery-2 data; <sup>b</sup>LSG: Laparoscopic Sleeve Gastrectomy; <sup>c</sup>QEWPR/QEWPR-R: Questionnaire on Eating and Weight Patterns/ Revised; MINI: Mini-International Neuropsychiatric Interview; NEO-PI-Rc: NEO Personality Inventory-Revised; SCID-Ic: The Structured Clinical Interview for the DSM-IV Axis I disorders; BED: Binge Eating Disorder; MDD: Major Depressive Disorder

**Table 2:** Range of overall assessments by study and bias domains.

Authors	Year	Domain 1: confounding	Domain 2: selection	Domain 3: classification of intervention	Domain 4: deviation from interventions	Domain 5: missing data	Domain 6: measurement of outcomes	Domain 7: selection of reported result	ROBINS-I overall	
Mitchell, et al.	2015	1	2	3	1	(0) 2	2	1	2.50	Moderate - Serious
Barbuti, et al.	2021	3	0	1	0 (3)	(0) 2	1	1	1.5	Moderate
Susmallian, et al.	2019	0	1	2	0	1	1	1	3	Serious
Webb, et al.	2011	2	2	2	1	(0) 2	2	2	2	Moderate
Wimmelmann, et al.	2015	2	1	1	1	(0) 2	1	1	1.5	Low-moderate
Alosco, et al.	2015	2	0	2	1	1	2	2	2	Moderate - Serious
Lavender, et al.	2014	3	0	2	0	2	2	2	2	Moderate - Serious

1. Risk of bias assessment: 0 No information; 1 Low; 2 Moderate; 3 Serious; 4 Critical

2. Bold figures indicate disagreement of two or more levels of bias across assessments

## Discussion

### Quality of studies reviewed

Results from the systematic review indicate scant evidence on the prevalence of psychopathology in studies with specified T2DM. Eighteen studies specified the sample were diagnosed with T2DM seeking bariatric surgery, with seven of these reporting at least one numerical value for the frequency of psychopathology. There were inconsistent methods of assessment used, including the threshold of diagnosis (e.g. BED) with the majority of studies using historical and not current measures of psychopathology. Very few studies noted co-interventions e.g. psychotropic medication use or current psychological intervention or other confounds which may influence the prevalence rates. Further, the background training of the reviewer making the diagnosis of psychopathology was rarely reported. Missing data were not reported in many of the studies. The majority of the studies were in treatment-seeking samples whilst advantageous in translating clinical research may also increase the risk of inception bias. Risk in the classification of groups was identified in the majority of studies where determinations of diagnosis of T2DM and markers were not clearly stated.

### Prevalence of psychopathology

The primary objective was to explore the rates of psychopathology in people with T2DM undergoing bariatric surgery. Webb and colleagues [17] in a sample of 488 bariatric surgical candidates, found that 8.2% of the sample with T2DM had comorbid Binge Eating Disorder (BED). It is noted however this diagnosis occurred using a clinical interview based on DSM-IV-TR criteria. The Questionnaire on Eating and Weight Patterns-Revised was also included to substantiate the diagnosis, however, methods of clinical cut-off and clinical interview threshold for diagnosing were not reported. The T2DM group, compared to the non-T2DM group was older ( $p < .001$ ). Of note, the group with T2DM and BED had elevated scores on the Beck Depression Inventory compared to the non-T2DM/non-BED control. Elevated scores were also found on the Binge Eating Scale, revealing a significant difference in the

T2DM and BED group compared to the control. It is taken into account, however, that the group of T2DM and BED included 40 participants. This sample included American participants in a clinical setting, which is taken into account when generalizing findings. Unfortunately, there were no data displayed on rates of psychopathology other than BED diagnosis, BDI, and BES scores. Further psychopathology rates were recorded for the pre-surgical setting. Further research is warranted to include rates of psychopathology (including other forms of disordered eating, mood, and anxiety-related conditions) post-surgery.

Wimmelmann, et al. [18]. Explored the psychological profile of 129 consecutive candidates undergoing Roux-en-Y gastric bypass (RYGB) where 35 patients (27.1%) had a diagnosis of T2DM. The groups were significantly different in mean age, whereas the T2DM group was significantly older. The authors found the sample with T2DM reported higher physical quality of life compared to those without a diagnosis of T2DM. However, when physical activity was added as a covariate along with sex, age, and BMI, the differences between the groups were no longer significant. It is noted participants were from a clinical sample in Copenhagen, which has implications for the generalisability of findings. On the NEO-FFI, the T2DM group scored significantly lower on neuroticism with slightly elevated extraversion and agreeableness compared to the non-T2DM group. However, when age and gender were added as covariates to the MANCOVA, the results were no longer significant. On the Symptom Checklist (SCL-90- Danish version), the T2DM group endorsed fewer psychiatric symptoms. The authors did not specify what symptoms this included. On measures of body image, using the BIQ, the T2DM group scored higher (indicating higher body image) compared to those without T2DM. The subgroup size is small, with only baseline psychopathology data. The psychological profile utilized the Neo-FFI and self-report measures only.

Susmallian, et al. [19] utilized a clinical sample of 300 consecutive patients undergoing Laparoscopic sleep gastrectomy, where 37 participants (12%) had diabetes. The authors did not specify if this was Type 2 diabetes. It was unstated how depression was measured in this sample, they





did note data was collected from psychologists. The authors reported that the people with diabetes were more likely to have depression, stating that 21.69% of the participants in the “depressed group” were diagnosed with diabetes, compared to the “non-depressed group” of which 7.21% had a diagnosis of diabetes at baseline. Whilst the authors published findings of depression for the group post-surgery, they did not include post-surgery results of the group with diabetes. Further studies could specify the method of measuring depression and investigate rates of psychopathology including depression and disordered eating in people with T2DM at multiple time points.

Barbuti, et al. [20]. Investigated mood disorders in a sample of 69 participants, of these 17 (24.6%) were diagnosed with T2DM. The small sample was from Italy and the majority (71%) were female which is noted with regard to the generalisability of the findings. The authors reported a higher prevalence of T2DM in those with mood disorders compared to those without mood disorders (27% vs 22%) however these results were not statistically significant. Mood disorders were assessed using the Mini-International Neuropsychiatric Interview (MINI). Of note, the authors stated that patients with unstable and/or severe psychiatric conditions were excluded from the recruitment likely increasing the risk of selection bias. Clinical interview by psychiatrists was the only method of assessment and was not substantiated with a self-report measure of mood. Demand characteristics such as social desirability bias may further impact the prevalence rates in this sample.

Mitchell, et al. [21]. Included 350 participants with BED and 1 875 without BED from 6 centers around America. There were 595 with diabetes (33%) without BED, compared to 114 (34%) who did have BED), compared 1206 (675) without diabetes and without BED, and 221 (66%) who had BED but did not have T2DM. BED was measured using questions adapted from the Questionnaire for Eating and Weight Patterns-Revised. It was unspecified how these were adapted. The authors also noted that 6 months rather than 3-month criteria were used which may impact the prevalence rates reported. As the authors noted, the diagnosis was made on self-report scales alone which is not widely accepted diagnostic practice. Further studies could utilize multimethod assessment for measuring BED (including clinician and self-report measures) with clearly defined cut-offs and based on current accepted diagnostic practice.

Alosco, et al. [22]. Included 67 patients, 64 of these patients were diagnosed with diabetes and found no significant difference in MDD between those that did and did not have diabetes using the SCID-I. The control group is less than 5, therefore, increasing the risk of bias when making comparisons. Only 3 patients of the entire sample met the criteria for a current depressive episode, therefore the authors used the history of MDD as the definition of psychopathology. As per the ROBINS-I, this increases the risk of selection of reported results bias.

Lavendar, et al. [23]. Included 15 (22.1% of 68) patients with T2DM. They revealed that 20.8% met the criteria for both T2DM and BED in their sample. Those with T2DM did not differ in a score of BED compared to those without T2DM with the entire

sample demonstrating improvement in attention, memory, and executive function from pre to post-surgery (12-month follow-up). It is noted that the authors state current and past psychiatric illness, alcohol or drug abuse, history of learning disorder or developmental disability were exclusion criteria for their study. On the ROBINS-I criteria, this exclusion criteria increases the risk of sampling and selection bias. Further, the authors noted they defined BED as the history of BED and did not include the current measure of BED, of which 6 patients met the criteria.

### Pre versus post surgery psychopathology prevalence

A secondary objective was to investigate if there is variation in the post-surgery rates of psychopathology compared to people pre-bariatric surgery (pre and post-frequency). Of the studies reviewed, all specified baseline rates of psychopathology as high for binge eating, mood disorders, and cognitive deficits. Of note, studies with T2DM and BED found elevated rates of depression, highlighting the vulnerability of this subgroup of candidates.

### Measurement of psychopathology in T2DM

Inconsistent methods of measuring psychopathology in T2DM undergoing bariatric surgery were found in the studies reviewed. It was also revealed that inconsistent definitions exist for the classification of psychopathology in this literature e.g. studies utilizing history but not current measures of BD and MDD. Webb, et al. [17], was the only study to our knowledge to include a multimodal assessment of binge eating disorder (e.g. clinical interview, QEWP, BES). No studies were found to the author’s knowledge, that followed the prevalence rate of psychopathology for people with T2DM before and after surgery, nor utilized multi-method assessment.

### Conclusion

Scant evidence exists which specifies cohorts of bariatric surgical patients with T2DM and rates of psychopathology. Further research is warranted to understand the risks, measures, and potential interventions for this subgroup.

#### (Appendix A-C)

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