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ORIGINAL CONTRIBUTIONS

The Impact of Psychiatric History and Peri-operative Psychological Distress on Weight Loss Outcomes 1 Year After Bariatric Surgery

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Abstract

Background To determine if self-reported baseline psychological distress moderates the association between lifetime psychiatric diagnosis and weight loss 1 year after bariatric surgery. An exploratory analysis assessed change in psychological distress from baseline on weight loss at 1 year.

Methods A retrospective cohort study using data from the Ontario Bariatric Registry for all individuals undergoing surgery between January 1, 2012, and December 31, 2018, with a complete baseline psychological assessment and 1-year post-operative weight recorded ($N = 11{,}159$).

Multiple linear regressions assessed the relationship between psychiatric diagnosis and percentage of excess body mass index loss (%EBMIL) at 1-year post-surgery, controlling for baseline body mass index, socio-demographics, medical co-morbidities, and surgical complications. Baseline psychological distress, measured with the EQ-5D-5L anxiety/depression rating, was examined as a moderator of this relationship. %EBMIL was separately regressed on change in psychological distress from baseline to 1 year, controlling for psychiatric diagnosis.

Results In the adjusted model, psychiatric diagnosis was associated with lower %EBMIL at 1 year ($B = -1.00$, $P = .008$). Baseline psychological distress was not a moderator, but had a significant main effect on %EBMIL ($B = -.84$, $P = .001$). Those who experienced a decrease in psychological distress at 1 year, or remained low throughout, fared better than those who increased or had persistently high symptoms.

Conclusions These findings support use of a self-report assessment for psychological distress prior to bariatric surgery. Addressing active psychological distress prior to and/or following surgery may increase the likelihood of successful outcomes.

Keywords Bariatric surgery · Weight loss · Mental disorders · Depression · Anxiety · Psychological distress

Key Points
- Psychological distress is a more important predictor of %EBMIL than psychiatric diagnosis.
- Reduction in psychological distress leads to better outcomes in the first year post-operatively.
- Psychological distress should be identified and managed for the best weight loss outcome.

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Introduction

The global prevalence of obesity is rising, with more than 650 million affected adults worldwide [1]. This is concerning because obesity is associated with numerous health-related complications, reduced quality of life (QoL), and mortality [2, 3]. Bariatric surgery is the most effective treatment for obesity [4], with most patients experiencing significant and sustained weight loss, reduced morbidity and mortality, and improved health-related quality of life [5, 6]. Psychiatric comorbidities, particularly mood and anxiety disorders, are highly prevalent among bariatric surgery patients [7–10], reflecting a bidirectional association between obesity and mental disorders [11, 12]. While reassuring that individuals with mental disorders are not excluded from bariatric surgery [13], there is concern about the impact of psychological health on post-surgical outcomes.

A number of studies have found that psychiatric co-morbidity negatively impacts post-operative weight loss outcomes. For instance, Muller et al. found that patients with an identified mental disorder at baseline had significantly lower %TWL at 4 years post-Roux-en-Y bypass (RYGB) or sleeve gastrectomy (SG) compared to those without [14]. A recent prospective study, which compared weight loss outcomes after SG, observed significantly reduced weight loss in patients with a baseline depressive disorder compared to patients without a pre-surgical depression diagnosis [15].

Conversely, other studies have found that a psychiatric history does not significantly impact bariatric surgery weight loss outcomes. Both US [16] and Canadian [17] retrospective cohort studies have reported no change or even greater post-operative weight loss among those with a pre-existing mental disorder compared to those with no psychiatric history. Similarly, a sub-study of the Longitudinal Assessment of Bariatric Surgery Research Consortium found that pre-operative current or lifetime psychiatric disorders were not a significant predictor of weight loss at 3-years post-bariatric surgery [18]. There are several factors which may contribute to the contradictory findings; many studies have had small sample sizes, assess psychiatric diagnoses at different time points, and weight loss outcomes vary. Additionally, studies do not always control for important covariates including medical co-morbidities and surgical complications.

With respect to post-operative psychopathology, a systematic review identified this as a stronger predictor of weight-related outcomes than any pre-operative psychopathology [19]. In comparison, a recent study found that having surgery may have increased incidence of 5-year depression compared to a matched non-surgical group [20]. The authors highlight the importance of identifying subclinical or undiagnosed depression in the pre-operative period and providing longer term post-operative mental health support [20].

There remains a need for more study on the complex relationship between psychological health and bariatric surgery outcomes, examining symptoms both at baseline and in the post-operative period. This study used a large dataset comprised of multiple bariatric centers in Ontario, Canada, to determine the association between psychiatric history and weight loss at 1 year. To differentiate the diagnosis itself from the baseline psychological status, the potential moderating effect of baseline psychological distress assessed by a subjective anxiety/depression rating was evaluated. In an exploratory analysis, the study further assessed how change in psychological distress from baseline to 1 year affected weight loss to evaluate if intervention and/or monitoring could impact outcomes among those who experience mental health problems pre- and post-operatively.

Materials and Methods

Design and Data Sources

A retrospective cohort study using de-identified data from the Ontario Bariatric Registry (OBR), a multi-center observational registry containing baseline and follow-up data on all consenting patients who undergo bariatric surgery [21]. Prior to surgery, a comprehensive pre-operative assessment is completed which involves the collection of demographic information, past medical history, height, and weight. A psychological assessment is also completed. Follow-up data are collected at pre-determined timepoints after surgery. Clinical charts are reviewed by trained reviewers who use data extraction forms to collect relevant data which are entered into the OBR. The OBR has research ethics approvals from all participating sites, with a consent rate of approximately 85% with some variability from year to year. De-identified data were provided to the study investigators in a password-protected Excel file.

Study Cohort

All patients aged 18 and over who underwent non-revision RYGB or SG between January 1, 2012, and December 31, 2018, were included, provided that a baseline/pre-operative and psychological assessment was completed and a 1-year post-operative weight recorded. A total of 18,453 individuals aged 18 and over were recorded in the OBR during the study period. Of these, 11,159 (60.5%) met the study inclusion criteria (Fig. 1).

Exposure

Pre-surgical Psychiatric History

Lifetime psychiatric history was assessed during the pre-operative psychological assessment. This interview was completed by a psychiatrist, social worker, psychologist, nurse, or other health care provider who screened for evidence of past or current psychiatric illness [22]. Clinicians in Canada use the Diagnostic and Statistical Manual of Mental Disorders; chart reviewers code the diagnoses into non-mutually exclusive pre-determined categories on the data extraction form. A referent group of participants without any psychiatric diagnosis was created.

Covariates

Demographic variables included age at time of surgery, sex [male, female], education [high school or below, above high

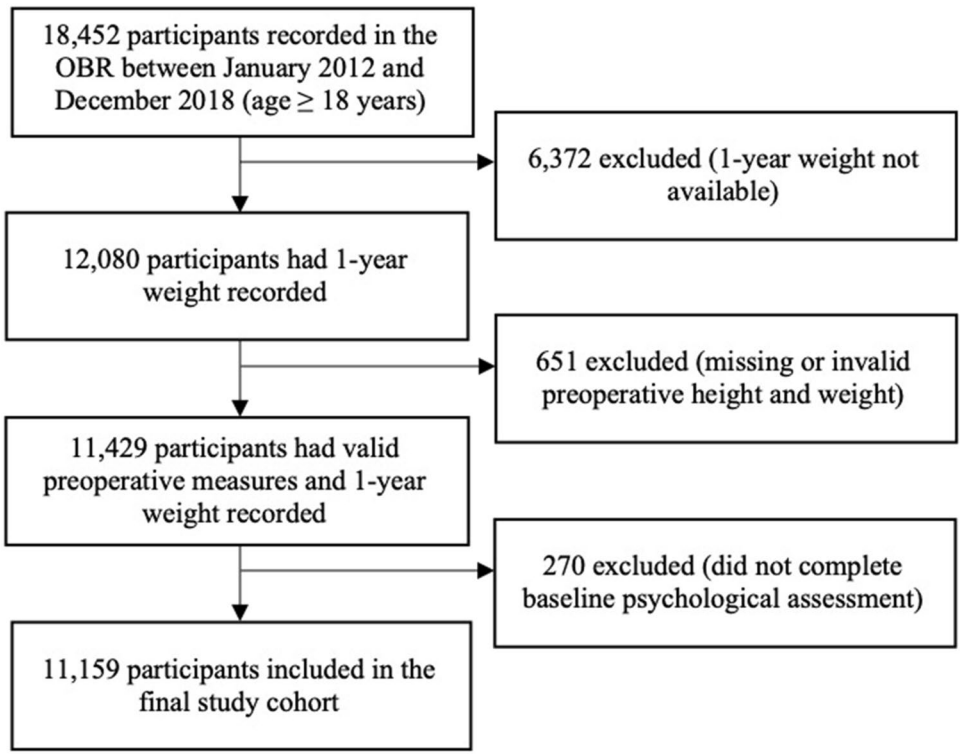

Fig. 1 Flow diagram illustrating inclusion and exclusion of study participants

school], and employment status [employed, unemployed/disability]; health variables included pre-operative baseline BMI and medical comorbidities [musculoskeletal pain, diabetes, cardiovascular disease, polycystic ovary syndrome (PCOS), chronic lung disease]; and surgical factors included year of surgery, type of surgery [RYGB, SG], and surgical complications within the first year post-operatively. Surgical complications were grouped into 4 non-mutually exclusive categories and coded as present or absent: anastomotic [anastomotic leak, stenosis/stricture], cardiorespiratory [deep vein thrombosis/pulmonary embolism, pulmonary complications, stroke, myocardial infarction, angina, heart failure], other non-anastomotic complications [hemorrhage, hernia, wound infection, persistent diarrhea, nutritional deficiency, bowel obstruction]. A variable for any revision or repair in the first year after surgery was also created.

Primary Outcome

Weight Loss

Percent of excess body mass index loss (%EBMIL), %TWL, and ΔBMI 1-year post-surgery were calculated. %EBMIL was selected as the primary outcome for multi-level modeling to emphasize the amount of weight loss required to reach a normal, target weight (defined as a BMI < 25 kg/m^2) [23, 24]. The formulae for the calculation of %EBMIL was:

$$\%\text{EBMIL} = \frac{\left[\text{pre-operative BMI} - \text{1 year BMI}\right]}{\left[\text{pre-operative BMI} - 25\right]} \times 100$$

Moderator

Psychological distress was measured at baseline via participant self-report on the anxiety/depression dimension of the EuroQoL-5D-5L (EQ-5D-5L). This scale has 5 levels: 1 = no anxiety/depression, 2 = slight anxiety/depression, 3 = moderate anxiety/depression, 4 = severe anxiety/depression, and 5 = extreme anxiety/depression. Levels 4 and 5 were combined due to low counts in the extreme category. The EQ-5D anxiety/depression item has demonstrated moderate performance for the screening of anxiety and depressive symptoms in community settings compared to the well validated Generalized Anxiety Disorder Questionnaire-2 item and Patient Health Questionnaire-9 item [25].

Exploratory Analysis

Psychological distress was repeated at 1 year with the EQ-5D-5L. A variable to reflect the change in anxiety/depression ratings from baseline to 1 year was created using a hierarchical coding scheme. Those who reported no or slight anxiety/depression throughout the year (EQ-5D-5L levels 1 or 2) were coded as "persistently low." Those who reported

moderate or higher anxiety/depression through the year (levels 3, 4, and 5) were coded as "persistently elevated." For the remaining individuals, those whose scores increased in value were coded as "increased," and those whose scores decreased were coded as "decreased."

Statistical Analysis

Analyses were conducted in SPSS, version 27. Baseline characteristics of the cohort were summarized descriptively. Weight loss outcomes at 1 year were compared between those with and without a psychiatric history; independent *T* tests for %TWL, and ΔBMI and a linear regression adjusting for baseline BMI for %EBMIL were completed. A 3-step linear regression was performed on %EBMIL, to evaluate the contribution of baseline and other covariates (step 1), psychiatric history (step 2), and baseline psychological distress (step 3). At each step, assumptions, model fit and the R^2 change were reviewed. If the psychiatric history was significant in step 2, the potential for moderation by baseline psychological distress was assessed in step 3. For moderation to be occurring, both the predictor and the moderator must be significantly associated with the outcome when entered in the same model, and then, the effect of the interaction term is tested in a subsequent model [26]. Effect sizes for all covariates in the final model were calculated by dividing the coefficient by the variance in the outcome measure. In an exploratory analysis, psychiatric history and change in psychological distress were entered after step 1. The reference category was the "persistently low" group.

Results

Table 1 summarizes baseline variables for all study participants ($N=11{,}159$), overall and by presence of a psychiatric history. A pre-surgical psychiatric history was documented in 5,828 individuals (52.2%). The vast majority of diagnoses were mood and anxiety disorders; see Supplemental Tables for counts of all diagnoses. Individuals with a pre-surgical psychiatric history were more often female with baseline musculoskeletal pain, cardiovascular disease, PCOS, and chronic lung disease. Weight loss outcomes at 1 year by psychiatric history are reported in Table 2, showing that for all outcomes, those with a psychiatric history had significantly less weight loss.

Table 3 summarizes the adjusted analyses ($n=9{,}791$). Lower pre-operative BMI, female gender, being employed, high school or below education, younger age, earlier year of surgery, RYGB, absence of diabetes, and absence of PCOS were significantly associated with greater %EBMIL at 1 year. Compared to no surgical complications, the presence of anastomotic and other non-anastomotic complications was also significantly associated with greater %EBMIL. In Model 2, the addition of a pre-surgical psychiatric history resulted in a significant R^2 change of 0.001 ($P=0.008$) and was associated with significantly lower %EBMIL ($B=-1.10$, $P=0.008$) (Table 3).

Adding baseline anxiety/depression in Model 3 further resulted in a significant R^2 change of 0.001 ($P=0.001$). Higher baseline psychological distress was significantly associated with lower %EBMIL ($B=-0.84$, $P=0.001$), and psychiatric diagnosis was no longer significant. Therefore, further moderation testing was not performed. All covariates identified as significant in Model 1, remained significant in Models 2 and 3.

One-year EQ-5D-5L ratings were available for 7,488 (67.1%) individuals in the cohort. From baseline to 1 year, 5,558 (74.2%) reported their psychological distress remained low, 504 (6.7%) remained high, and 509 (6.8%) and 1,059 (14.1%) increased and decreased, respectively. In the exploratory analysis (Table 4), change in psychological distress contributed significantly to the base model (R^2 change $=0.004$, $P<0.001$). Compared to the group who had persistently low scores, those who were persistently high, or increased experienced significantly less weight loss ($B=-5.54$, $P<0.001$; $B=-2.62$, $P=0.006$, respectively).

Discussion

This study evaluated the impact of lifetime psychiatric history on %EBMIL at 1 year, then adjusted for actual pre- and peri-operative psychological health, while controlling for sociodemographic, medical, and surgical co-variates. Pre-operative psychiatric diagnosis was significantly associated with lower %EBMIL 1 year post-operatively, but this association disappeared when baseline psychological distress was accounted for. When psychological distress remained high or increased from baseline to 1 year, %EBMIL decreased. In all models, however, the mental health variables had very small effect sizes supporting that other non-mental health factors are substantially more important in bariatric surgery outcomes.

That said, these findings are consistent with other studies reporting that psychiatric diagnosis is a negative predictor of weight loss after bariatric surgery [27, 28], but a growing literature reporting results like ours distinguishes any psychiatric diagnosis from actual baseline levels of psychological distress. Fuchs et al. [29] reported that the presence of well-controlled psychiatric illness was not a significant predictor of percent excess weight loss (%EWL) 1 year after SG or laparoscopic adjustable gastric banding. Similarly, a prospective study by Marek et al. [30] found that pre-surgical self-reported scores consistent with low positive emotions and high behavioral/

Table 1 Baseline variables of the study cohort by pre-surgical psychiatric history

Baseline variable	Overall 11,159	*Pre-surgical psychiatric history*	
		Yes 5828 (52.2%)	No 5331 (47.8%)
Age [year], mean (SD)	45.6 (10.3)	45.6 (10.2)	45.7 (10.4)
Pre-op weight [kg], mean (SD)	130.4 (24.5)	129.4 (23.8)	131.5525 (25.2)
Pre-op BMI [kg/m^2], mean (SD)	47.3 (7.5)	47.2 (7.4)	47.5 (7.6)
Female gender, *n* (%)	9373 (84.0)	5164 (88.6)	4209 (79.0)
Level of education, *n* (%)			
High school or below	2673 (24.0)	1338 (23.0)	1335 (25)
Above high school	7407 (66.4)	3927 (67.4)	3480 (65.3)
Missing	1079 (9.7)	563 (9.7)	516 (9.7)
Employment status, *n* (%)			
Employed	7396 (66.3)	3583 (61.5)	3813 (71.5)
Unemployed/on disability	2651 (23.8)	1662 (28.5)	989 (18.6)
Missing	1112 (10.0)	583 (10.0)	529 (9.9)
Surgery type, *n* (%)			
RYGB	9803 (87.8)	5086 (87.3)	4717 (88.5)
SG	1356 (12.2)	742 (12.7)	614 (11.5)
Year of surgery, *n* (%)			
2012	1316 (11.8)	590 (10.1)	726 (13.6)
2013	1783 (16.0)	894 (15.3)	889 (16.7)
2014	1251 (11.2)	635 (10.9)	616 (11.6)
2015	1170 (10.5)	629 (10.8)	541 (10.1)
2016	1937 (17.4)	1027 (17.6)	910 (17.1)
2017	1955 (17.5)	1104 (18.9)	851 (16.0
2018	1747 (15.7)	949 (16.3)	798 (15.0)
Musculoskeletal pain, *n* (%)	8125 (72.8)	4365 (74.9)	3760 (70.5)
Diabetes, *n* (%)	3112 (27.9)	1633 (28.0)	1479 (27.7)
Cardiovascular disease, *n* (%)	733 (6.6)	442 (7.6)	291 (5.5)
Polycystic ovary syndrome, *n* (%)	851 (7.6)	479 (8.2)	372 (7.0)
Chronic lung disease, *n* (%)	1564 (14.0)	974 (16.7)	590 (11.1)
Anastomotic complications, *n* (%)	161 (1.4)	94 (1.6)	67 (1.3)
Cardiorespiratory complications, *n* (%)	83 (.7)	38 (.7)	45 (0.8)
Other non-anastomotic complications, *n* (%)	1133 (10.2)	598 (10.3)	535 (10.0)
Revision or repair, *n* (%)	261 (2.3)	150 (2.6)	111 (2.1)
Baseline anxiety or depression, *n* (%)			
Not anxious or depressed	4894(43.9)	1555 (26.7)	3392 (62.6)
Slightly anxious or depressed	3009 (27.0)	1925 (33.0)	1084 (20.3)
Moderately anxious or depressed	1747 (15.7)	1424 (24.4)	323 (6.1)
Severely or extremely anxious or depressed[a]	340 (3.0)	300 (5.1)	40 (0.8)
Missing	1169 (10.5)	624 (10.7)	545 (10.2)

BMI, body mass index; *RYGB*, Roux-en-Y gastric bypass; *SG*, sleeve gastrectomy

[a]Combined due to low counts in the extremely category

externalizing dysfunction on the Minnesota Multiphasic Personality-Inventory-2-Restructured Form, predicted lower 5-year weight loss, independent of psychiatric history. In our cohort, 27% of individuals with no psychiatric history reported subjective anxiety/depression symptoms at baseline, with a quarter of this group reporting moderate or higher intensity symptoms. Moreover, while a proportion of individuals experienced a decrease in psychological distress, a group increased from no or minimal symptoms to moderate or higher symptoms over the year. This supports Arhi et al.'s finding that depression diagnoses may increase post-surgery due to case finding or aggravation of symptoms following acclimatization to the effects of surgery [20]. As symptoms are treatable,

Table 2 Bariatric surgery weight loss outcomes at 1 year by pre-surgical psychiatric history

Outcome	Total sample $N=11,159$	*Pre-surgical psychiatric history*			
		Yes	No	*t* statistic (*df*)	*P* value
Year 1 weight [kg], mean (SD)	90.2 (20.8)	89.8 (20.6)	90.7 (21.0)	2.1 (11,157)	.035
Year 1 BMI [kg/m^2], mean (SD)	32.7 (6.6)	32.8 (6.7)	32.7 (6.4)	− .8 (11,157)	.42
%EBMIL, mean (SD)[a]	68.5 (23.0)	68.1 (23.7)	68.8 (22.1)	− 2.6 (11,156)	.008
%TWL, mean (SD)	30.7 (9.3)	30.4 (9.5)	31.0 (9.0)	3.4 (11,145.8)	.001
ΔBMI [kg/m^2], mean (SD)	14.6 (5.2)	14.4 (5.2)	14.8 (5.2)	4.0 (11,157)	< .001

BMI, body mass index; *%EBMIL*, percentage of excess BMI loss; *%TWL*, percentage of total weight loss; *ΔBMI*, change in BMI from baseline to 1 year. [a]Linear regression was used to control for baseline BMI as it significantly influences %EBMIL

Table 3 Linear regressions for %EBMIL ($n=9791$)

Parameter	*Model 1*		*Model 2*		*Model 3*		
	B (CI)	*P*	*B (CI)*	*P*	*B (CI)*	*P*	*Effect size*
Pre-operative BMI	− 1.18 (− 1.23, − 1.12)	< .001	− 1.18 (− 1.23, − 1.12)	< .001	− 1.17 (− 1.23, − 1.12)	< .001	.051
Female sex (vs male)	5.46 (4.34, 6.58)	< .001	5.65(4.52, 6.77)	< .001	5.63 (4.50, 6.76)	< .001	.24
Above high school (vs high school or less)	− 1.01 (− 1.94, − .086)	.03	− .96 (− 1.88, − .034)	.04	− 1.00 (− 1.92, − .072)	.035	.043
Unemployed/disability (vs employed)	− 1.41 (− 2.35, − .47)	.003	− 1.25 (− 2.19, − .31)	.01	− 1.11 (− 2.05, − .16)	.022	.048
Age	− .26 (− .31, − .22)	< .001	− .27 (− .31, − .22)	< .001	− .27 (− .31, − .23)	< .001	.012
Year of surgery	− .53 (− .74, − .31)	< .001	− .51 (− .72, − .29)	< .001	− .51 (− .73, − .30)	< .001	.022
SG surgery (vs RYGB)	− 11.02 (− 12.28, − 9.76)	< .001	− 10.98 (− 12.25, − 9.72)	< .001	− 10.93 (− 12.20, − 9.67)	< .001	.47
Baseline musculoskeletal pain (vs none)	− .80 (− 1.71, .11)	.08	− .75 (− 1.66, .16)	.11	− .71 (− 1.62, 0.20)	.13	.031
Baseline diabetes (vs none)	− 6.87 (− 7.82, − 5.92)	< .001	− 6.85 (− 7.80, − 5.91)	< .001	− 6.87 (− 7.82, − 5.92)	< .001	.3\0
Baseline cardiovascular disease (vs none)	.60 (− 1.04, 2.24)	.47	.69 (− .95, 2.32)	.41	.80 (− .84, 2.44)	.34	.035
Baseline polycystic ovary syndrome (vs none)	− 1.95 (− 3.48, − .42)	.013	− 1.94 (− 3.47, − .41)	.01	− 1.94 (− 3.47, − .41)	.013	.084
Baseline chronic lung disease (vs none)	− .41 (− 1.59, .76)	.49	− .33 (− 1.51, .84)	.58	− .30 (− 1.47, 0.87)	.62	.013
Anastomotic complications (vs none)	4.38 (1.04, 7.72)	.01	4.47 (1.13, 7.81)	.009	4.49 (1.16, 7.83)	.008	.19
Cardiorespiratory complications (vs none)	.62 (− 4.14, 5.38)	.80	.53 (− 4.23, 5.29)	.83	.59 (− 4.17, 5.35)	.81	.026
Other non-anastomotic complications (vs none)	2.87 (1.49, 4.25)	< .001	2.87 (1.49, 4.25)	< .001	2.84 (1.46, 4.22)	< .001	.12
Any revision or repair (vs none)	1.54 (− 1.08, 4.16)	.25	1.58 (− 1.04, 4.20)	.24	1.55 (− 1.07, 4.17)	.25	.067
Pre-surgical psychiatric history (vs none)			− 1.10 (− 1.91, − .29)	.008	− .53 (− 1.41, .35)	.24	.023
Baseline psychological distress					− .84 (− 1.35, − .33)	.001	.036

B, unstandardized regression coefficient; *%EBMIL*, percentage of excess BMI loss; *BMI*, body mass index

peri-operative psychological and/or psychopharmacological treatment could impact weight loss success for those with high baseline distress levels. The use of a self-report screening tool as part of the baseline assessment can help to flag individuals at risk. The importance of psychiatric screening is further highlighted by studies which have found that pre-operative psychiatric diagnoses are a risk factor for negative mental health outcomes post-bariatric

Table 4 Exploratory regression analysis for change in anxiety/depression on %EBMIL ($n = 7488$)

Parameter	*B (CI)*	*P*
Pre-operative BMI	−1.21 (−1.27 − 1.14)	< .001
Female sex (vs male)	6.31 (5.03, 7.59)	< .001
Above high school (vs high school or less)	−.56 (−1.61, .50)	.30
Unemployed/disability (vs employed)	−1.00 (−2.09, .086)	.071
Age	−.29 (−.33, −.24)	< .001
Year of surgery	−.44 (−.68, −.20)	< .001
SG surgery (vs RYGB)	−10.50 (−11.96, −9.03)	< .001
Baseline musculoskeletal pain (vs none)	−.91 (−1.95, .14)	.09
Baseline diabetes (vs none)	−6.35 (−7.43, −5.27)	< .001
Baseline cardiovascular disease (vs none)	.59 (−1.27, 2.45)	.53
Baseline polycystic ovary syndrome (vs none)	−2.59 (−4.30, −.88)	.003
Baseline chronic lung disease (vs none)	−.23 (−1.57, 1.12)	.74
Anastomotic complications (vs none)	3.60 (−.19, 7.40)	.06
Cardiorespiratory complications (vs none)	1.39 (−3.90, 6.66)	.61
Other non-anastomotic complications (vs none)	2.26 (.71, 3.81)	.004
Any revision or repair (vs none)	.81 (−2.22, 3.83)	.60
Pre-surgical psychiatric diagnoses (vs none)	−.45 (−1.43, .54)	.38
Decreased anxiety/depression (vs persistently low anxiety/depression)	−.24 (−1.61, 1.14)	.73
Increased anxiety/depression (vs persistently low anxiety/depression)	−2.62 (−4.48, −.76)	.006
Persistently elevated anxiety/depression (vs persistently low anxiety/depression)	−5.53 (−7.45, −3.62)	< .001

B, unstandardized regression coefficient; *%EBMIL*, percentage of excess BMI loss; *BMI*, body mass index

surgery (e.g. increased rates of substance use disorders [31] and early hospital readmissions [32]).

This study does have some limitations. Weight loss was measured at 1-year post-surgery; as such, it is unclear if the significant associations would persist over time. In addition, psychiatric history was assessed by clinicians rather than standardized assessment tools which may be subject to higher interrater reliability. Furthermore, not all potentially relevant comorbidities were captured in the available data (e.g., obstructive sleep apnea). A large proportion of surgery recipients were excluded because a 1-year weight was not recorded in the OBR. There was a modest difference in the presence of a psychiatric history among those with and without a 1-year weight (52.2% of those with a weight recorded vs 55.6% of those without). Baseline psychological distress ratings also tended to be higher among those with no weight recorded (see Supplementary Table). This may have underestimated the relationship between psychological health and weight loss. The combination of psychiatric history and active symptoms at time of surgery represents a particularly vulnerable group for poor outcomes and loss to follow-up. Similarly, the exploratory analysis was only possible for a subset of the cohort for whom 1-year EQ-5D-5L ratings were available.

Conclusion

Overall, mental health variables contribute minimally to weight loss outcomes following bariatric surgery. Regardless, elevated baseline psychological distress presents an important opportunity to intervene. Surgery can produce significant weight loss, reduce obesity-associated comorbidities, and improve mental health [12, 20, 33]. In some cases, however, psychological distress may increase post-operatively and further impede maintenance of weight loss. A comprehensive and multi-disciplinary approach should be adopted in the peri-operative psychosocial evaluation and management of bariatric surgery patients [34]. Rather than focusing on specific psychiatric diagnoses, the assessment should evaluate for active symptoms affecting an individual's function and the stability of any known psychiatric conditions [13]. A self-report tool can augment this assessment. Severe mental illness, which is more rare, requires additional consideration but can still result in successful outcomes for carefully selected and well-supported individuals [33, 35]. Post-operative monitoring and early intervention for emerging psychological distress could also lead to improved outcomes.

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Data Availability Data used in the study were obtained from the Ontario Bariatric Registry and can be made available upon request and appropriate approvals being obtained.

Declarations

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Conflict of Interest The authors declare no competing interests.

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