

Title of the article: Impact of psychosocial and behavioral factors on 5-year outcomes after bariatric surgery

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Research Article

Keywords: Bariatric surgery, Binge-eating disorder, Weight loss outcomes, Quality of life, Psychosocial factors, Physical activity, Alcohol use

Posted Date: October 6th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10962859/v1>

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Additional Declarations: No competing interests reported.

Abstract

Purpose:

To examine pre- and postoperative psychosocial and behavioral factors associated with long-term outcomes following metabolic and bariatric surgery (MBS).

Patients and methods:

In a prospective cohort of 120 individuals who underwent MBS, preoperative psychosocial and behavioral variables were collected. Five-year outcomes were obtained via self-report questionnaire including weight measures (%TWL, %EWL, BMI), BAROS QoL indices, eating behavior, physical activity, and alcohol consumption.

Results:

The cohort comprised 120 patients (94 women, 26 men); mean age 37.4 years; mean preoperative BMI 41.0 kg/m². Procedures performed were RYGB (n = 106) and SG (n = 14). At five years mean %EWL was 80.3±26.4. Preoperative binge-eating disorder (BED) showed a tendency of association with lower %EWL. Postoperative binge-eating behavior (BEB) was strongly associated with lower weight loss and QoL, and higher prevalence of snacking behavior. Alcohol consumption increased from baseline to follow-up but was not associated with weight-loss or QoL outcomes.

Conclusion:

Preoperative BED was not predictive of weight reduction or QoL, while postoperative BEB was a robust marker of worse weight-loss and QoL. Results suggest limitations in current categorical diagnostic criteria for BED in identifying underlying predictive eating behaviors, probably indicating a need for better dimensional assessment allowing earlier targeted interventions.

INTRODUCTION

Obesity is strongly associated with metabolic risk factors, reduced life expectancy, and high prevalence of psychosocial disorders that impair functioning and quality of life (Syn et al. 2021; GBD 2024). Regional and international health organizations have translated this evidence into prevention and management policies that include pharmacotherapy and metabolic and bariatric surgery (MBS) as treatment options (Laddu et al. 2024; Kloock et al. 2023).

MBS is effective for weight reduction and improvement of obesity-related comorbidities. From a psychosocial perspective, substantial evidence indicates that most individuals experience improvements

in quality of life and psychological functioning after surgery (Herpetz et al. 2017; Thiara et al. 2017). However, a meaningful subset of patients experiences adverse clinical and psychosocial outcomes, including insufficient weight loss or significant weight regain (Voorwinde et al. 2020; Brissman et al. 2021), increased rates of alcohol and substance misuse (Li & Wu 2016), and elevated suicide risk (Castaneda et al. 2019; Müller et al. 2019).

Long-term follow-up studies aimed at improving preoperative assessment and postoperative monitoring remain inconclusive, and there is ongoing debate about predictors of negative outcomes (Szmulewicz et al., 2019; Trooboff et al., 2019; Law et al., 2023). The mechanisms underlying adverse outcomes are not fully understood but likely involve interacting physiological, behavioral, and psychological factors (Martin-Fernandez et al., 2021; Dirks et al., 2022; Lüscher et al., 2023). Psychological and behavioral variables—such as depressive and anxiety disorders, impulsivity related to substance misuse, and binge eating—are frequently identified as important targets for preoperative assessment (Dawes et al., 2016; Herpetz et al., 2017; Ogden et al., 2019; Block & Marek, 2020; Tholey & Tichansky, 2020; Hoyt & Walter, 2022; Sarwer et al., 2024).

Both preoperative and postoperative factors may influence long-term outcomes following MBS. Preoperatively, binge eating, alcohol and other substance misuse, and psychiatric disorders or symptoms have been repeatedly implicated (Li & Wu 2016; Kops et al. 2021; Jacobs et al. 2024). Postoperative determinants include adherence to lifestyle changes, vitamin and supplement use, and ongoing alcohol or drug consumption. The emergence or persistence of binge-eating behaviors after surgery—often expressed as frequent snacking on energy-dense foods—can substantially impede weight loss and contribute to weight regain over time (Athanasiadis et al., 2021; Jacobs et al., 2024).

The present study investigates preoperative and postoperative psychosocial and behavioral factors that may affect long-term outcomes after MBS. Drawing on the literature, we hypothesize that preoperative binge eating, sedentary behavior, and psychiatric disorders are associated with similar postoperative presentations and will influence primary outcomes of weight loss and quality of life. We also examined correlations between psychosocial/behavioral factors at five years post-surgery and these outcome measures.

METHODS

Study design and setting

We conducted a prospective cohort study at an outpatient bariatric surgery clinic that evaluates roughly 500 unique patients per year, primarily referred from private healthcare–affiliated medical practices. Baseline data were collected during preoperative consultations with a multidisciplinary team from January through December 2019. Follow-up information was obtained in 2024 via a self-report questionnaire, approximately five years after surgery.

Recruitment, sampling, and consent

All patients who met the inclusion criteria—age ≥ 18 years and provision of a signed Free and Informed Consent Form (FICF)—and who underwent laparoscopic Roux-en-Y gastric bypass (RYGB) or sleeve gastrectomy (SG) in 2019 were recruited. At the five-year follow-up, patients were contacted by phone or WhatsApp and invited to participate; those who consented received a digital questionnaire via Google Forms. Of 436 patients contacted, 120 (28%) agreed to participate and completed the questionnaire. The study was approved by the Research Ethics Committee of [anonymized], where most procedures were performed, and the protocol and related documents were approved by the local institutional review board.

Data collection

Preoperative variables

Baseline psychosocial and behavioral variables that could influence bariatric outcomes were recorded systematically according to the clinic protocol.

Eating behavior. Binge-eating disorder (BED) was diagnosed using DSM-5 criteria: recurrent episodes of eating an objectively large amount of food in a discrete period (more than most people would eat in a similar time), accompanied by a sense of loss of control and occurring *at least once weekly for the past three months*. BED, anxiety, and depressive disorders were identified during preoperative psychiatric interviews conducted by an experienced psychiatrist ([anonymized]) using the Portuguese version of the Structured Clinical Interview for DSM-5 (SCID-5-CV) (First et al., 2017).

Alcohol consumption. For comparative analyses, alcohol use was categorized as: (1) non-use, (2) social use, or (3) hazardous (risky) drinking. Hazardous drinking was defined as >14 standard drinks per week for men (approximately 14 glasses of wine/week or 7 L of beer/week) and >7 standard drinks per week for women. Social use comprised any alcohol consumption below the hazardous threshold.

Physical activity. Physical activity during the six months preceding assessment was classified as: (1) sedentary or no planned physical activity; (2) sporadic exercise, defined as ≥ 1 hour per session on fewer than two occasions per week; or (3) regular exercise, defined as ≥ 1 hour per session on two or more occasions per week.

Postoperative variables

Participants completed a self-report questionnaire (SRQ) that recorded current weight, lifestyle habits, and quality of life (QoL) using the Bariatric Analysis and Reporting Outcome System (BAROS) (Oria & Moorehead 2009).

The BAROS instrument is widely used to evaluate outcomes after bariatric surgery and is appropriate for assessing postoperative QoL, clinical status, and weight-related changes. To measure change in overall QoL, we used the BAROS-2 visual scale. Each of the six domains—satisfaction with body image, physical

well-being, social life, work capacity, sexual life, and attitude toward eating—was scored using a 10-point Likert-type scale in the BAROS scoring key.

Questions about eating behavior were adapted from the Eating Disorder Examination-Questionnaire (EDE-Q) (Fairburn & Cooper 1993), a widely used instrument with well-established psychometric properties (Berg et al. 2012). In the SRQ, objective binge eating (OBE) was defined as episodes involving an objectively large amount of food. Subjective binge eating (SBE) was defined as episodes that the respondent perceived as binges accompanied by a loss of control. Postoperative binge-eating behavior (BEB) was defined as the presence of binge episodes with loss of control (OBE and SBE) occurring *at least once weekly during the past month*.

Several studies have used the EDE-Q to assess eating behavior in bariatric samples, reporting associations between subjective binge eating, compulsive snacking, and postoperative outcomes (Colles et al. 2008; White et al. 2010; de Zwaan et al. 2010; Moser et al. 2020). Our adaptation of the EDE-Q included three items that targeted eating episodes (amount of food, loss of control, and frequency) and three items that assessed compensatory behaviors (self-induced vomiting, laxative use, and exercise). Hrabosky et al. (2008) examined the psychometric properties of EDE-Q items related to eating disturbance in bariatric patients and reported a Cronbach's alpha of 0.72, indicating acceptable internal consistency and suggesting the items measure a common construct.

Considering the particularities of post-bariatric patients and evidence that snacking or grazing negatively affects weight outcomes after surgery (Conceição et al. 2015), we added two items to the SRQ assessing snacking patterns: frequency and typical amount consumed.

Continuous snacking was defined as consuming a large amount of food between meals ("snacking") at least once weekly during the past month. The SRQ also assessed current adherence to psychiatric and/or psychotherapeutic treatment, physical activity level, alcohol and other substance use, and compliance with vitamin supplementation. A translated version of the SRQ is provided in Appendix 1; the corresponding author can be contacted to obtain the Portuguese SRQ and the original study data.

Data analysis

Ideal weight was defined as the weight (kg) corresponding to a BMI of 25 kg/m². Weight outcomes were calculated as follows:

Percent total weight loss (%TWL) = $[(\text{Weight}_{2019} - \text{Weight}_{2024}) \times 100] / \text{Weight}_{2019}$.

Percent excess weight loss (%EWL) = $[(\text{Weight}_{2019} - \text{Weight}_{2024}) \times 100] / \text{Excess weight}_{2019}$, where $\text{Excess weight}_{2019} = \text{Weight}_{2019} - \text{Ideal weight}$.

BMI reduction (ΔBMI) = $\text{BMI}_{2019} - \text{BMI}_{2024}$.

Statistical analysis

Continuous variables were summarized as mean $\pm$ SD and categorical variables as n (%). Distributional assumptions were assessed using the Shapiro–Wilk test and graphical inspection, and homogeneity of variance using Levene’s test when applicable. Two-group comparisons used independent-samples t tests, Welch’s t tests, or Mann–Whitney U tests; comparisons across three or more groups used one-way ANOVA or Kruskal–Wallis tests, as appropriate. Categorical associations were assessed using Pearson’s χ^2 or exact Fisher’s tests, according to expected cell counts. Significant tests were followed by post-hoc pairwise comparisons with adjustment for multiple testing. Within participant baseline to follow-up comparisons used paired t tests or Wilcoxon signed-rank tests for continuous variables, McNemar’s test for binary variables, and the Stuart–Maxwell test for categorical variables with more than two levels. Multiple linear regression models assessed associations between preoperative BED and five-year continuous outcomes, after adjustment for prespecified baseline covariates. Results are reported as B, SE, standardized β , 95% CI, and p values. Regression assumptions were assessed using residual and collinearity diagnostics. All tests were two-sided; $p < 0.05$ was considered statistically significant, whereas $0.05 \leq p < 0.10$ was considered suggestive but not statistically significant. Analyses were performed using IBM SPSS Statistics for Windows, version 23.

RESULTS

Baseline characteristics of the 120 patients who underwent bariatric surgery are presented in Table 1. Sex-stratified baseline data are shown in Table 6 as Supplementary Information [if permitted by the Journal].

Table 1. Evolution of variables from baseline (2019) to 5-year follow-up (2024):

Variables	Baseline (2019)	Follow-up (2024)	Statistic
Weight (Kg) [Minimum - Maximum]	113.8 ± 20.4 [79-180]	79.4 ± 18.5 [48-150]	Wilcoxon: p< 0.001
BMI (Kg/m²) [Minimum - Maximum]	41.1 ± 4.5 [35.2-52.6]	28.6 ± 4.8 [20.6-46.2]	T-test: p< 0.001
Binge-eating behavior (1)	BED (2019) No (n= 103, 85.8%) Yes (n= 17, 14.2%)	BEB (2024) No (n= 60, 50%) Yes (n= 60, 50%)	McNemar: p< 0.001 $\chi^2= 1.71, p = 0.191^a$
Alcohol consumption	No (n= 86, 71.7%) Social (n= 32, 26.7%) Risky (n= 2, 1.7%)	No (n= 51, 42.5%) Social (n= 51, 42.5%) Risky (n= 18, 15.0%)	Stuart-Maxwell: p< 0.001
Physical activity (1) Sedentary (2) Sporadic (<2x/week) (3) Regular (³ 2x/week)	(1) Sedentary (n= 91, 75.8%) (2) Sporadic (n= 14, 11.7%) (3) Regular (n= 15, 12.5%)	(1) Sedentary (n= 41, 34.2%) (2) Sporadic (n= 32, 26.7%) (3) Regular (n= 47, 39.2%)	Stuart-Maxwell: p< 0.001

Notes:

Quantitative data are shown as mean and standard deviation (mean ± SD). Categorical/nominal data are shown as number of cases and percent [n (%)].

(a) Association between baseline BED-2019 and follow-up BEB-2024 not statistically significant ($\chi^2= 1.71, p = 0.191$).

Comparative analysis of baseline (2019) and follow-up (2024) variables

Comparisons between baseline (2019) and five-year follow-up (2024) are presented in Table 1. At baseline, 17 participants (14.2%) met criteria for binge-eating disorder (BED) and 103 did not. By follow-up, 50.0% of the sample reported compulsive eating behavior (BEB). Among those with baseline BED, 11 of 17 (64.7%) reported BEB in 2024, whereas 49 of 103 (47.6%) without baseline BED reported BEB at follow-up; this difference was not statistically significant ($\chi^2 = 1.71, p = 0.191$). Risky alcohol consumption increased from 2 participants (1.7%) at baseline to 18 (15.0%) at follow-up, a change that reached statistical significance ($p < 0.001$).

Association between baseline factors and outcome variables

Table 2 summarizes five-year weight-loss and quality-of-life (QoL) outcomes stratified by baseline characteristics. No significant differences in outcome measures were observed for groups defined by sex, baseline alcohol consumption, baseline physical activity, or baseline anxiety. Surgical procedure was associated with divergent outcomes: patients who underwent sleeve gastrectomy (SG) experienced smaller weight reductions and tended to report lower overall QoL scores at five years compared with Roux-en-Y gastric bypass (RYGB) patients. Baseline depression was associated with significantly lower QoL at follow-up ($p = 0.029$); item-level analyses linked baseline depression to reduced satisfaction with food ($p = 0.035$) and showed a trend toward decreased work capacity ($p = 0.051$). Follow-up QoL scores generally did not differ by sex, although men reported greater satisfaction with sexual life than women (Mann-Whitney: $p = 0.010$). Sex-stratified outcome data are provided in Table 7, as Supplementary Information. [if permitted].

Table 2. Associations of baseline factors with 5-year weight-loss and quality-of-life outcomes after bariatric surgery (n= 120).

Baseline factors (2019)	%TWL (mean ± SD)	%EWL (mean ± SD)	BMI reduction (mean ± SD)	BAROS QoL (mean ± SD)
Sex	30.4 ± 8.6	80.6 ± 27.5	12.6 ± 3.8	7.6 ± 1.3
Men (n = 26, 21.7%)	30.3 ± 9.4	80.2 ± 26.2	12.4 ± 4.2	7.0 ± 1.8
Women (n = 94, 78.3%)	30.3 ± 9.2	80.3 ± 26.4	12.5 ± 4.1	7.1 ± 1.7
Total (n = 120)	p= 0.987 ^a	p= 0.950 ^b	p= 0.834 ^b	p= 0.110 ^a
p value				
Surgical technique	31.1 ± 8.7	82.2 ± 25.2	12.8 ± 4.0	7.2 ± 1.7]
RYGB (n = 106, 88.3%)	24.6 ± 10.8	66.2 ± 31.3	10.1 ± 4.5	6.2 ± 1.5
SG (n = 14, 11.7%)	p= 0.012^b	p= 0.032^b	p= 0.019^b	p= 0.055 ^a
p value				
Binge-eating disorder	30.8 ± 9.1	82.2 ± 26.2	12.6 ± 4.1	7.14 ± 1.71
No (n = 103, 85.8%)	27.5 ± 9.4	68.8 ± 25.3	11.8 ± 4.2	7.10 ± 1.71
Yes (n = 17, 14.2%)	p= 0.141	p= 0.053 ^b	p= 0.349 ^a	p= 0.889 ^a
p value		p= 0.064 ^f		
Alcohol consumption	30.0 ± 10.2	79.7 ± 29.1	12.4 ± 4.5	7.2 ± 1.8
No (n = 86, 71.7%)	31.1 ± 6.0	81.8 ± 17.9	12.8 ± 2.9	6.9 ± 1.6
Yes (n = 34, 28.3%)	p= 0.533 ^b	p= 0.700 ^b	p= 0.624 ^b	p= 0.379 ^a
p value				
Physical activity	30.9 ± 9.3	81.6 ± 25.7	12.7 ± 4.3	7.1 ± 1.8
(1) Sedentary	27.1 ± 9.2	71.6 ± 31.5	11.2 ± 3.4	7.5 ± 1.2
(n = 91, 75.8%)	29.8 ± 8.5	80.9 ± 25.9	12.0 ± 3.5	7.2 ± 1.6
(2) Sporadic (< 2x/week)	p= 0.238 ^c	p= 0.422 ^d	p= 0.407 ^d	p= 0.595 ^c
(n = 14, 11.7%)				
(3) Regular (≥ 2x/week)				

(n = 15, 12.5%)				
p value				
Anxiety disorder	30.3 ± 9.4	80.9 ± 27.3	12.4 ± 4.2	7.2 ± 1.7
No (n= 101, 84.2%)	30.3 ± 8.1	77.4 ± 21.1	12.7 ± 3.7	6.9 ± 2.0
Yes (n= 19, 15.8%)	p= 0.937 ^a	p= 0.538 ^b	p= 0.799 ^b	p= 0.555 ^a
p value				
Depressive disorder	30.6 ± 8.8	81.1 ± 26.1	12.6 ± 4.0	7.2 ± 1.7
No (n= 111, 92.5%)	26.4 ± 13.0	70.0 ± 29.8	10.9 ± 6.0	6.0 ± 1.4
Yes (n= 9, 7.5%)	p= 0.191 ^b	p= 0.225 ^b	p= 0.412 ^e	p= 0.029^a
p value				

Notes: %TWL = percentage total weight loss; %EWL = percentage excess weight loss; BMI = body mass index; BAROS QoL = Bariatric Analysis and Reporting Outcome System quality-of-life score; RYGB = Roux-en-Y gastric bypass; SG = sleeve gastrectomy; BED = binge-eating disorder. Descriptive values are presented as mean ± SD. Alcohol consumption was dichotomized as no alcohol consumption versus any alcohol consumption (social or risky drinking). Statistically significant p values ($p < .05$) are shown in bold.

(a) Mann–Whitney U test. (b) Independent-samples t test. (c) Kruskal–Wallis test. (d) One-way ANOVA. (e) Welch's t test. (f) Multiple linear regression with %EWL as the outcome and baseline BED as the main independent variable, adjusted for age, sex, surgical technique, alcohol consumption, physical activity, anxiety, and depression. Physical activity was modeled as a categorical variable. The adjusted association between baseline BED and %EWL was $B = -13.74$, $SE = 7.34$, standardized $\beta = -0.182$, $t = -1.87$, 95% CI $[-28.27, 0.80]$, $p = .064$.

With respect to baseline binge-eating disorder (BED), there were no statistically significant differences in five-year weight-loss or QoL indices; however, BED at baseline showed a trend toward lower percent excess weight loss (%EWL) ($p = 0.053$). To assess potential confounding, we performed multiple linear regression models including baseline BED and the other baseline factors listed in Table 2 for each outcome. The regression analyses preserved the non-significant trend for lower %EWL among BED-2019 patients ($p = 0.064$) and confirmed no significant effect of baseline BED on the remaining outcomes.

Relation between follow-up factors and outcome variables

Relations between postoperative behavioral and psychosocial factors and five-year outcomes are summarized in Table 3. Patients with postoperative binge-eating behavior (BEB-2024) had significantly lower mean %TWL, %EWL, BMI reduction, and total BAROS QoL scores than patients without BEB.

BEB-2024 patients also reported continuous snacking more frequently (33/60, 55.0%) than No-BEB patients (6/60, 10.0%) ($p < 0.001$) (see Supplementary Table 8). [if permitted]

Table 3. Associations between 5-year postoperative factors and weight-loss and quality-of-life outcomes (n = 120).

Postoperative factors (2024)	%TWL (mean ± SD)	%EWL (mean ± SD)	BMI reduction (mean ± SD)	BAROS QoL (mean ± SD)
Postoperative BEB	32.4 ± 8.6	86.4 ± 25.0	13.3 ± 4.1	7.5 ± 1.7
No (n = 60, 50.0%)	28.1 ± 9.4	73.8 ± 26.5	11.6 ± 4.1	6.7 ± 1.6
Yes (n = 60, 50.0%)	p= 0.019^a	p= 0.017^a	p= 0.036^a	p= 0.005^b
p value				
Frequency postoperative BEB	32.4 ± 8.6	86.4 ± 25.0	13.3 ± 4.1	7.5 ± 1.7
(1) absent (n= 60; 50%)	30.8 ± 9.1	81.7 ± 25.4	12.6 ± 3.9	6.8 ± 1.7
(2) ³ 1 times/w (n= 29; 24.2%)	25.8 ± 9.0	66.5 ± 25.4	10.8 ± 3.9	6.5 ± 1.8
(3) ≥ 2 times/w (n= 31; 25.8%)	p= 0.008^c	p= 0.002^d	p= 0.024^d	p= 0.009^c
Overall p value	1 vs 2: p= 0.085	1 vs 2: p= 1.000	1 vs 2: p= 1.000	1 vs 2: p= 0.086
Pairwise comparisons	1 vs 3: p= 0.003	1 vs 3: p< 0.001	1 vs 3: p= 0.019	1 vs 3: p= 0.013
	2 vs 3: p= 0.017	2 vs 3: p= 0.063	2 vs 3: p= 0.262	2 vs 3: p= 1.000
Alcohol consumption	30.2 ± 9.7	83.0 ± 29.3	12.2 ± 4.0	7.0 ± 1.8
No (n= 51, 42.5%)	30.9 ± 9.2	79.5 ± 25.8	12.9 ± 4.1	7.0 ± 1.6
Social (n= 51, 42.5%)	28.8 ± 8.8	75.2 ± 18.5	12.0 ± 4.5	7.7 ± 1.5
Risky (n= 18, 15.0%)	p= 0.454^c	p= 0.536^a	p= 0.360^c	p= 0.324^c
p value				
Physical activity	30.1 ± 8.6	81.5 ± 26.6	12.2 ± 3.7	6.3 ± 1.5
(1) Sedentary	29.6 ± 11.4	78.5 ± 32.1	12.3 ± 5.0	7.1 ± 1.8
(n= 41; 34.2%)	30.9 ± 8.1	80.6 ± 22.1	12.8 ± 3.8	7.9 ± 1.5
(2) Sporadic (< 2x/week)	p= 0.905^c	p= 0.887^d	p= 0.745^d	p< 0.001^c
(n= 32; 26.7%)	-	-	-	1 vs 2: p= 0.121
(3) Regular (³ 2x/week)				1 vs 3: p< 0.001
(n= 47; 39.2%)				2 vs 3: p= 0.081
Overall p value				
Pairwise comparisons				

Notes: %TWL = percentage total weight loss; %EWL = percentage excess weight loss; BMI = body mass index; BAROS QoL = Bariatric Analysis and Reporting Outcome System quality-of-life score; BEB = binge-eating behavior. Values are presented as mean ± SD. Statistically significant p values ($p < .05$) are shown in bold.

(a) Independent-samples t test. (b) Mann–Whitney U test. (c) Kruskal–Wallis test. (d) One-way ANOVA. Pairwise comparisons following significant omnibus tests were adjusted for multiple comparisons using the Bonferroni method.

Binge-eating frequency was coded as 0 = absent, 1 = ≥ 1 and < 2 episodes/week, and 2 = ≥ 2 episodes/week. Participants with no binge episodes (Group 1; $n = 60$) demonstrated higher mean %TWL, %EWL, and BAROS QoL scores than those with ≥ 2 episodes/week (Group 3; $n = 31$), with Group 2 ($n = 29$; ≥ 1 and < 2 episodes/week) showing intermediate outcomes. Post hoc comparisons confirmed significant differences between Group 1 and Group 2, as well as a significant difference in %TWL between Groups 2 and 3 (Table 3). Additionally, women reported a higher prevalence of snacking behavior than men ($p = 0.013$) (see Supplementary Table 7). [if permitted]

No significant associations were found between follow-up alcohol consumption or regular physical activity and the weight outcome measures. However, patients reporting regular physical activity (≥ 2 sessions/week) had significantly higher BAROS QoL scores than sedentary patients ($p < 0.001$) and showed a trend toward higher QoL compared with patients reporting sporadic activity ($p = 0.081$) (Table 3).

Associations between binge-eating disorder (2019) and eating behavior characteristics after bariatric surgery

Associations between preoperative binge-eating disorder (BED-2019) and postoperative eating behaviors are presented in Table 4. No significant differences were observed in the prevalence of BEB-2024 or snacking behavior between patients with and without BED-2019, although those with preoperative BED tended to report loss of control over eating more frequently than non-BED patients ($p = 0.092$).

Table 4. Associations between preoperative binge-eating disorder (BED-2019) and postoperative binge-eating (BEB-2024) and snacking behaviors.

Preoperative BED-2019	Postoperative BEB-2024	Excessive eating (2024)	Loss of control (2024)	Continuous snacking (2024)
No (n= 103; 85.8%)	No: 54 (52.4%) Yes: 49 (47.6%)	No: 49 (47.6%) Yes: 54 (52.4%)	No: 53 (48.3%) Yes: 50 (51.7%)	No: 72 (69.9%) Yes: 31 (30.1%)
Yes (n= 17; 14.2%)	No: 6 (35.3%) Yes: 11 (64.7%)	No: 6 (35.3%) Yes: 11 (64.7%)	No: 5 (29.4%) Yes: 12 (70.6%)	No: 9 (52.9%) Yes: 8 (47.1%)
p values	χ^2 : p= 0.191 p< 0.001 ⁽¹⁾	p= 0.347.	p= 0.092.	p= 0.167.

Notes: Categorical counts/percentages are shown. Fisher’s exact test was used for the “eating without control” comparison because of small expected counts (cells <5); other comparisons used χ^2 with df = 1.

(1) Preoperative BED (baseline - binge episodes at least once weekly for the past three months) and postoperative BEB (5-year follow-up - binge-eating episodes at least once weekly for the past month) were assessed using different operational definitions. Therefore, although a paired McNemar test was performed, its result should be interpreted cautiously and should not be considered a direct test of change in BED prevalence over time.

An exploratory longitudinal analysis of eating-behavior trajectories is shown in Table 5. Of 120 patients, 54 (45.0%) never met criteria for BED, 11 (9.2%) exhibited a continuous course of binge eating, 6 (5.0%) showed a remitting course, and 49 (40.8%) had an apparent *de novo* onset of binge-eating behavior postoperatively.

Patients with a continuous course of binge eating had significantly lower %EWL than patients who never met BED criteria (ANOVA p = 0.034; Games-Howell post hoc p = 0.021). Regarding BAROS QoL, patients with *de novo* binge eating had lower scores than those without pre- or postoperative BED (Games-Howell p = 0.045).

Table 5. Associations between pre- and postoperative eating behavior classifications and 5-year outcomes (n = 120).

Eating behavior	%TWL	%EWL	Continuous snacking	BAROS QoL
(1) Never BE (BED-/BEB-) (n= 54, 45.0%)	32.5 ± 8.0	86.8 ± 23.1	No: 49 (90.7%) Yes: 5 (9.3%)	7.6 ± 1.7
(2) Remitted (BED+/BEB-) (n= 6; 5.0%)	30.3 ± 11.9	78.9 ± 31.3	No: 5 (83.3%) Yes: 1 (16.7%)	7.6 ± 1.3
(3) De novo (BED-/BEB+) (n= 49; 40.8%)	28.9 ± 9.9	77.1 ± 28.6	No: 23 (46.9%) Yes: 26 (53.1%)	6.7 ± 1.6
(4) Continued (BED+/BEB+) (n= 11; 9.2%)	26.0 ± 8.0	63.4 ± 20.9	No: 4 (36.4%) Yes: 7 (63.6%)	6.8 ± 1.9
Total (n= 120)	30.3 ± 9.2	80.3 ± 26.4	No: 81(67.5%) Yes: 39 (32.5%)	7.1 ± 1.7
Overall p values	p= 0.100 ^a	p= 0.034^b	p< 0.001^c	p= 0.050 ^a
Pairwise comparisons		1 vs 2: p= 0.890 1 vs 3: p= 0.230 1 vs 4: p= 0.034 2 vs 3: p= 0.999 2 vs 4: p= 0.637 3 vs 4: p= 0.383	1 vs 2: p= NS 1 vs 3: p= NS 1 vs 4: p= 0.002 2 vs 3: p= NS 2 vs 4: p= 0.787 3 vs 4: p= NS	

Notes: BED = preoperative binge-eating disorder; BEB = postoperative binge-eating behavior; %TWL = percentage total weight loss; %EWL = percentage excess weight loss; BAROS QoL = Bariatric Analysis and Reporting Outcome System quality-of-life score. Values are presented as mean ± SD or n (%), as appropriate. Statistically significant p values (p < .05) are shown in bold.

(a) Kruskal–Wallis test. (b) One-way ANOVA. (c) Fisher–Freeman–Halton exact test.

Pairwise comparisons were performed using ANOVA with Tukey adjustment.

Pairwise comparisons for *Continuous snacking* were performed using Fisher's exact tests with Bonferroni adjustment; Groups 1 and 4 differed significantly (p adjusted = .002), whereas Groups 2 and 4 did not (p adjusted = .787).

DISCUSSION

Preoperative factors

In this cohort of 120 patients who underwent metabolic and bariatric surgery (MBS), we evaluated preoperative variables as predictors of five-year weight loss and quality of life (QoL). Overall, preoperative factors generally did not predict postoperative weight loss or QoL.

Preoperative binge-eating disorder (BED) showed only a tendency toward association with percent excess weight loss (%EWL) at five years. Although earlier studies reported associations between lifetime BED and poorer weight-loss indices (e.g., Sallet et al., 2007), the present sample produced a weaker signal at five years. Meta-analytic reviews are inconsistent: some report no effect of preoperative BED on postoperative weight loss (Kops et al., 2021; Lobo et al., 2023), whereas others identify preoperative BED as a predictor of poorer outcomes (Jacobs et al., 2024). These discrepant findings have been attributed to differences in assessment methods (Marek et al., 2017; Kops et al., 2021), questions about the diagnostic validity of BED (Taba et al., 2021; Aylward et al., 2022), and the moderating role of non-eating-behavior factors (Athanasiadis et al., 2021).

Baseline psychiatric disorders (anxiety and depressive disorders) were not significantly associated with weight-loss outcomes. Although Lüscher et al. (2023) reported a link between higher preoperative anxiety scores and long-term weight regain, most prior studies have not confirmed such an association (Dawes et al., 2016). In contrast, preoperative depression in our sample was associated with lower QoL scores at five years, which may reflect persistent or recurrent depressive symptoms during follow-up.

Postoperative factors

At five years, postoperative binge-eating behavior (BEB) was robustly associated with poorer outcomes. Patients reporting BEB had significantly lower mean weight-loss indices (%TWL, %EWL, and BMI reduction) and reduced BAROS QoL scores compared with patients without BEB. Increased binge frequency showed a dose-response pattern: participants with two or more binge episodes per week had the worst weight and QoL outcomes, those with one to two episodes per week had intermediate results, and those without episodes fared best. Continuous snacking was highly prevalent among BEB cases and likely contributed to these differences.

Physical activity at follow-up was not significantly associated with weight-loss measures in this sample but was positively correlated with QoL. Patients who reported regular physical activity (≥ 2 sessions per week) had substantially higher BAROS QoL scores than sedentary patients and showed a trend toward higher QoL than those with sporadic activity. This observation aligns partially with guideline

recommendations that approximately 150 minutes per week of moderate-to-vigorous physical activity supports optimal postoperative outcomes (Livhits et al., 2010), although we did not detect a parallel effect on weight loss in our cohort.

Longitudinal trajectory of eating behavior

Consistent with several recent reports and reviews (Jacobs et al., 2024; Reas et al., 2025), the presence of postoperative binge-eating behavior (BEB) in our cohort was more strongly associated with worse long-term outcomes than preoperative BED. At five years, BEB was associated with significantly lower weight-loss and QoL indices, and outcome measures worsened in a graded fashion with increasing binge and snacking frequencies.

On the other hand, although preoperative BED might be expected to identify patients who could benefit from early preventive interventions, in our sample baseline BED showed only a trend toward worse %EWL and did not consistently predict other long-term outcomes. This limited predictive value is concordant with multiple prior studies reporting inconsistent associations between baseline BED and postoperative weight loss, while converging on the conclusion that postoperative or persistent disordered eating is more clearly linked to adverse outcomes.

A striking finding in our cohort was the marked increase in reported compulsive eating from baseline (14.2%) to five years (50%). This contrasts with much of the literature, which typically reports reductions in binge-eating prevalence after surgery (Taba et al., 2021). We observed a high proportion of new onset BEB during follow-up ($\approx 41\%$), substantially higher than values reported in some long-term cohorts (for example, 8.1% *de novo* incidence reported by Reas et al., 2025).

This discrepancy can be explained by two main factors:

Assessment differences - baseline BED was diagnosed by clinician interview (SCID-5-CV applying DSM-5 criteria, requiring bingeing $\geq$ weekly for the prior three months), whereas BEB at follow-up was assessed via EDE-Q self-report items referring to the past month (bingeing $\geq$ weekly). Self-report instruments such as the EDE-Q often yield higher prevalence estimates than interviewer-administered diagnostic interviews (Fairburn & Beglin, 1994; Kalarchian et al., 2000; Everett et al., 2021).

Reporting bias at baseline - our cohort was recruited from private healthcare networks where patients were aware of eligibility criteria for bariatric surgery. Some patients may have underreported compulsive eating at baseline—intentionally or unconsciously—because of concerns that disclosure could delay or prevent surgery. Thus, although the SCID-5-CV assessment was structured and reliable, its validity may have been affected by social desirability and selection pressures in this setting.

Course and correlates of BED/BEB

In our sample, most patients with preoperative BED (11/17, 65%) continued to exhibit compulsive eating at five years, showing persistence rather than universal remission. Postoperative BEB cases reported

more frequent snacking and worse QoL, suggesting that frequent snacking may act as a postoperative behavioral correlate or surrogate of binge eating in this population.

Transdiagnostic traits and implications for screening

Given the variable course of diagnostic BED and the limited predictive utility of baseline categorical diagnoses in our data, focusing on transdiagnostic psychopathological traits (e.g., impulsivity, poor inhibitory control, emotion dysregulation) may improve risk stratification and intervention targeting. Recent evidence suggests that such traits are shared across disorders (e.g., BED and substance-use disorders) and may better predict maladaptive postoperative behaviors (Tabá et al., 2021; Azevedo et al., 2021; Yeo et al., 2021; Sarwer et al., 2024).

In summary, it can be concluded that postoperative BEB — whether persistent or *de novo* — is strongly associated with poorer weight-loss and QoL outcomes at five years. Baseline categorical BED diagnosis had limited predictive power in this sample, likely reflecting both measurement differences and context-dependent underreporting. These findings support routine, long-term behavioral surveillance after bariatric surgery and suggest that moving beyond categorical BED toward transdiagnostic trait assessment may better identify patients at risk for adverse postoperative trajectories.

Alcohol and substance use after surgery

We observed a significant increase in risky alcohol consumption after surgery. This finding echoes prior reports of heightened postoperative alcohol and substance-use disorders and hypotheses of “transfer of dependence” from food to alcohol or drugs (Li & Wu, 2016; Miller-Matero et al., 2020; Capelo et al., 2023; Steffen et al., 2015). The role of preoperative psychopathology in predicting postoperative substance misuse remains unsettled (Herpertz et al., 2017). Although some studies suggest higher postoperative alcohol risk after RYGB compared with SG (Ivezaj et al., 2019), we found no statistically significant difference between surgical techniques in postoperative alcohol patterns or in prevalence of BEB/snacking in our cohort; sample-size imbalance limits definitive conclusions. Notably, SG patients had lower weight loss and a trend toward lower QoL in our sample ($p = 0.055$).

Study limitations:

These findings should be interpreted considering several limitations. First, the response rate was low (120/436; 28%), raising the possibility of response bias. Second, outcome data relied entirely on self-report questionnaires; objective clinical measures (for example, measured weight or medical records) were not available. Third, BED at baseline and BEB at follow-up were assessed using different operational definitions. Although a structured DSM-5 interview was used to diagnose BED at baseline, patients may have under-reported symptoms at that time to avoid perceived barriers to surgery. Fourth, the small number of sleeve gastrectomy cases ($n = 14$) created a substantial imbalance that limits the reliability of comparisons with RYGB.

Together, these limitations underscore the need for improved preoperative screening (validated instruments, structured interviews, and repeated assessments) and for strategies to increase follow-up adherence so that preventive and therapeutic interventions can be delivered throughout the postoperative period.

Conclusion

$$(I\ 449 + M\ 1.086 + R\ 805 + D\ 1,408 + C\ 91) = 3.809$$

Most preoperative variables in this cohort did not predict five-year outcomes. A few tendencies, however, are notable. Preoperative binge-eating disorder (BED) showed trends toward lower %EWL and more frequent uncontrolled eating episodes—both linked to poorer weight loss and QoL. Postoperative binge-eating behavior (BEB) was strongly associated with worse weight-loss outcomes and lower QoL scores.

Postoperative physical activity and alcohol use were not significantly associated with weight loss. Regular exercise (≥ 2 times per week), however, was consistently associated with better QoL, and alcohol consumption increased after surgery.

Declarations

Author Contribution

Author contributions: - PCS 1,2 — contributed to study design, literature review, data collection, statistical analysis, and manuscript writing. - DDAN 1 — contributed to literature review, statistical analysis, and manuscript writing. - MAS 2 — contributed to study design, literature review, data collection, and manuscript writing. - ACFF 2 — contributed to study design, literature review, data collection, and manuscript writing. - BAPG 2 — contributed to study design, literature review, data collection, and manuscript writing. - ABSG 2 — contributed to literature review, data collection, and manuscript writing. - ERC 2 — contributed to literature review, data collection, and manuscript writing. - BG 2 — contributed to literature review, data collection, and manuscript writing. - CS 2 — contributed to literature review, data collection, and manuscript writing. - VGM 2 — contributed to literature review, data collection, and manuscript writing. - JAS 2 — contributed to study design, literature review, and manuscript writing. All authors were involved in writing the paper and had final approval of the submitted version.

Data Availability

The data that support the findings of this study are not openly available due to reasons of sensitivity and are available from the corresponding author upon reasonable request. Data are located in controlled access data storage at Sallet Institute of Medicine.

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