

Maladaptive Eating Patterns, Quality of Life, and Weight Outcomes Following Gastric Bypass: Results of an Internet Survey

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Bariatric surgery is the most effective treatment for severe obesity. However, evidence suggests that maladaptive eating behaviors such as binge eating, grazing, and a loss of control when eating may impact postsurgical weight outcomes. The current study sought to characterize the weight outcomes, eating patterns, and perceived health-related quality of life of individuals 3–10 years following gastric bypass (GBP) surgery and to assess the relationships between eating behaviors, weight outcomes, and quality of life. Eligible participants ($N = 497$) completed an Internet survey of their eating behaviors, health-related quality of life, and weight history. Participants self-reported a mean maximum postsurgical loss of 81% of their excess weight and maintained a mean weight loss of 70% 3–10 years following surgery (mean 4.2 years). Eighty-seven percent reported weight regain ranging from 1 to 124 lb (mean 22.6 lb). Frequency of binge eating, a loss of control when eating, and grazing were all significantly correlated with greater weight regain (binge eating $r = 0.24$, $P = 0.006$; loss of control $r = 0.36$, $P < 0.01$; grazing $r = 0.39$, $P < 0.001$) and lesser excess weight loss (EWL) (binge eating $r = -0.21$, $P = 0.013$; loss of control $r = -0.41$, $P < 0.001$; grazing $r = -0.27$, $P < 0.001$). Poorer health-related quality of life was associated with binge eating disorder (BED) ($t[463] = 9.7$, $P < 0.001$) and grazing two or more times per week ($t[361] = 9.0$, $P < 0.001$). These findings suggest that eating disturbances and a loss of control when eating are significant following GBP and are risk factors for diminished weight outcomes.

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INTRODUCTION

Bariatric surgery is currently the most effective treatment for severe obesity, resulting initially in significant weight loss (1,2). However, the long-term maintenance of weight loss following surgery remains in question. Between the first and second years following surgery, weight loss often stabilizes and a substantial proportion of individuals begin to regain lost weight (3,4). Maladaptive eating behaviors, such as binge eating and grazing, may contribute to reduced or reversed success of bariatric surgery and ultimately impact quality of life. With the popularity of weight-loss surgery continuing to rise, greater understanding of the risk factors that can detract from optimal weight outcomes is needed.

One of the most common psychiatric conditions reported in patients presenting for bariatric surgery is binge eating disorder (BED), with between 10 and 50% of patients meeting criteria for this condition (5–9). Re-emergence of binge eating following surgery may influence postsurgical weight outcomes (10). Despite the physical limitations of surgery on stomach capacity, binge eating is not always eliminated. Although

binge eating episodes may decrease or be eliminated in the short term, long-term studies report a considerable amount of binge eating after bariatric surgery, primarily in patients who engaged in bingeing prior to surgery (4,6,11–15).

Meeting the full clinical criteria for BED in a population with surgically modified stomachs that limit the consumption of large quantities of food presents a challenge. Some studies have eliminated the “eating a larger amount of food than normal within a 2-h period” criteria in the assessment of postsurgical binge eating recognizing that, for many, binge behaviors may be limited in expression by the physiological changes brought on by the surgery (4,6,16,17). Studies that have found a complete absence of binge eating behavior postsurgery all employed the *DSM-IV* “large amount of food” criteria in the assessment of binge eating (5,18–20). The necessity of including an amount criterion continues to be debated in BED literature (21,22). A sense of loss of control over the eating episode, as well as the cumulative number of eating episodes, may be more important clinical features of bingeing in this population than the amount of food consumed in one period of time (23). These feelings of

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loss of control are often reported before surgery and have been theorized to be one of the primary reasons for seeking bariatric surgery, in addition to weight reduction (24).

Grazing behavior, defined as repeated episodes of consumption of smaller quantities over a long period of time with accompanying feelings of loss of control, may also contribute to poor weight outcomes. Although similar to binge eating in that it includes subjective episodes of consumption accompanied by a loss of control, grazing is physiologically more possible following bariatric surgery than large binges. Saunders (17) found that 80% of patients who endorsed binge eating or grazing with loss of control before surgery reported a re-emergence of these behaviors 6 months after surgery, suggesting that pre-surgical binge eating may re-emerge as grazing postsurgically in the context of reduced stomach capacity. Additionally, a sense of loss of control over eating continues following surgery, with as many as 46% of patients regularly sensing a loss of control over their eating (11).

Maladaptive eating patterns following surgery have considerable impact on weight and psychological outcomes. Individuals who binge demonstrate smaller reductions in BMI than those who do not, as well as more weight regain (15,16). Both loss of control when eating and grazing after surgery have been associated with poorer weight loss results and with psychological distress (25). Binge eating may also play a role in quality of life following weight-loss surgery, and may even have a greater impact on quality of life than weight *per se* (26).

More long-term information is needed regarding the outcomes and eating patterns of individuals who have undergone bariatric surgery. Weight regain appears to be more likely to occur as postoperative time increases. At ~18–24 months following surgery, many patients begin to consume larger quantities of food, likely by eating small amounts continuously or more frequently (27). As postoperative time increases, patients may learn how to circumvent the restriction and can experience a recurrence of disordered eating, potentially leading to weight gain. The purpose of this article is to characterize the weight outcomes, eating patterns, and perceived quality of life of individuals 3–10 years following one type of weight-loss surgery, gastric bypass (GBP), and to assess the relationships between eating behaviors and three outcome measures: percentage of excess weight loss (%EWL), weight regain, and perceived quality of life. As such, we seek to explore the relationship between the components of binge eating (e.g., sense of loss of control over eating) that might be most relevant following surgery, and to understand how this might affect outcomes. We hypothesized that frequency of binge eating, grazing, and episodes of loss of control would be negatively correlated with %EWL and positively correlated to weight regain. Finally, we predicted a negative correlation with health-related quality of life and binge eating and grazing when controlling for weight outcomes.

METHODS AND PROCEDURES

Participants

Participants were Internet users ($N = 497$) who had undergone open or laparoscopic Roux-en-Y GBP surgery between 3 and 10 years

prior to participation in the study. Participants were recruited from a national Web site for individuals who are considering, or who have undergone, weight-loss surgery. The Web site provides information about weight-loss surgery and fosters communication via message boards and forums. Participants were not compensated for participation but could enter a raffle for a \$50 gift certificate. Inclusion criteria were (i) age 18–65 years, (ii) English-speaking, and (iii) Roux-en-Y GBP surgery >36 months and <10 years prior to the study. Participants diagnosed with Prader-Willi syndrome or Bardet-Biedl syndrome were excluded from analyses due to their genetic propensity to obesity and weight gain. We included only participants who had positive postsurgical outcomes to see how potential shifts in maladaptive eating behaviors or eating patterns may have shifted weight outcomes. As such, participants with “fair” and “poor” maximum postsurgical weight loss (weight gain or weight loss of <25%) were classified as unsuccessful and not included in the analyses. Six hundred and ninety-five respondents logged on to complete the survey. One hundred and seventy participated were ineligible to complete the survey because they did not have surgery >3 years ago and/or did not have GBP surgery. An additional 28 were excluded because they did not meet other eligibility criteria. The remaining 497 surveys were included in the analysis.

Measures

Weight outcomes. Weight outcomes were assessed using a series of self-report questions. Excess weight was measured in pounds over ideal body weight as determined by the Hamwi formula in which ideal body weight for men is calculated as 106 lb for the first 5 feet; 6 lb for each inch over 5 feet; and 100 lb for the first 5 feet and 5 lb for each inch over 5 feet for women (28). Weight-loss outcomes were reported as %EWL. Successful weight outcomes following surgery were reported according to the scoring classification presented in the bariatric analysis and reporting outcome system (29). Weight regain was assessed using a series of self-report questions regarding weight history and defined as the difference in pounds from the lowest postsurgical weight (before any weight regain) to present weight.

Eating patterns and behaviors. The Questionnaire on Eating and Weight Patterns Revised (QEWP-R) is a 28-item self-report questionnaire designed to assess the components, duration, and frequency requirements for the proposed *DSM-IV* BED diagnosis. In consideration of stomach capacity changes following surgery, the QEWP-R was modified for this study to reflect this physiological limitation.

Questions regarding food consumption included the following:

- 1a. During the past 6 months, did you often eat within a 2-hour period what most people would regard as an unusually large amount of food?
- 1b. During the past 6 months, did you often eat within a 2-hour period what most people would regard as an unusually large amount of food for someone who has had weight-loss surgery?

Questions regarding loss of control included the following:

- 2a. During the times when you ate this way, did you often feel you couldn't stop eating or control how much you were eating? (for those who endorsed large quantities)
- 2b. During the past 6 months, did you often have periods of time when you felt like you couldn't stop eating or control how much you were eating? (for those who denied large quantities)

Classification. Loss of control over eating was characterized by periods in which the respondent could not stop or control their eating. Binge eating was characterized by consumption of subjectively large amounts of food accompanied by experiences of loss of control over eating.

Modified BED was diagnosed based on current *DSM-IV* criteria:

1. Subjects endorsed eating subjectively large quantities of food in a discrete period of time (1a or 1b above),
2. Subjects sensed a lack of control over eating during the episode,
3. Subjects had three or more behavioral indicators of loss of control,
4. Subjects showed marked distress over binge eating, and
5. Subject reports binge eating occurs on average at least 2 days a week for a 6-month period.

Grazing: "Grazing," a pattern of eating or nibbling continuously over an extended period of time, has been described as a meaningful maladaptive eating pattern in the literature (17,30). Individuals categorized as engaging in grazing reported nibbling continuously at least 2 days a week for a 6-month period, in addition to an inability to stop or control their eating while nibbling.

Although the criteria are similar to those of BED, no measures have been developed to formally assess grazing as such. The following questions were added to the QWEP-R.

1. During the past 6 months, did you often eat or nibble continuously ("graze") over an extended period of time?
2. During the times when you ate this way, did you often feel you couldn't stop eating or control how much you were eating?

Classification: Grazing behavior was characterized by the presence of both features. Grazers or "grazing disorder" was a characterization given to those for whom grazing behavior occurs on average at least 2 days a week for a 6-month period.

Health-related quality of life. The Moorehead-Ardelt Quality of Life Questionnaire II is a validated ($\alpha = 0.84$) six-question self-report instrument designed to measure self-perceived quality of life in postoperative obese individuals. The instrument examines self-esteem, physical well-being, social relationships, work, sexuality, and eating behavior, and is scored on a 10-point Likert scale ranging from "very poor" to "very good" (31).

Data collection

All information was gathered through a self-report survey that was completed on the Internet. The survey included 100 questions and was designed to be completed in <15 min. Participants were also asked demographic questions including age, gender, ethnicity, and education, as well as their current weight, presurgical height and weight, and weight loss following surgery.

Study protocol was approved by the Committee on Clinical Investigations of the Albert Einstein College of Medicine.

Statistical analysis

Data were analyzed using SPSS 14.0 (SPSS, Chicago, IL). For all analyses, $P < 0.05$ was considered statistically significant. Correlation coefficients were calculated to explore linear relationships among continuous variables. Pearson correlation coefficients were reported. Differences in mean values of continuous variables were tested using *t*-test procedures (independent samples).

RESULTS

Participants

Of the 497 subjects who met eligibility criteria and completed the survey, the mean age was 43.2 years (range 21–65). The majority were female (96.5%) and white (90%), and 70% reported at least some college education. Eighty percent were married/partnered and 11% lived alone. Most (72%) had surgery between 3 and 5 years prior to the study. Sample characteristics are provided in [Table 1](#).

Table 1 Characteristics of postgastric bypass patients (N = 497)

	N	%	Mean (s.d.)
Race or ethnicity ^a			
White	445	90.1	
Black/African American	27	5.5	
Hispanic/Latino	14	2.8	
Native American	4	0.8	
Gender ^a			
Male	22	4.4	
Female	475	95.6	
Highest education level ^a			
Grade school	2	0.4	
High school	87	17.5	
Some college	201	40.4	
College degree	147	29.6	
Graduate degree	46	9.3	
Years after surgery ^a			4.2 (1.1)
3–4	127	25.6	
4–5	229	46.1	
5–6	84	16.9	
6–7	40	8.0	
7–8	12	2.4	
8–9	2	0.4	
9–10	3	0.6	
Age (years)			43.2 (8.4)
Geographic area			
Urban	160	32.2	
Rural	138	27.8	
Suburban	199	40.0	
Cohabitation status			
Alone	56	11.3	
Spouse/partner	397	80.0	
Roommate	9	1.8	
Child	28	5.6	
Parent	2	0.4	

^a χ^2 and/or ANOVA indicate differences at the $P < 0.05$ level.

Weight outcomes

Participants reported a mean maximum EWL of 81% following surgery, with 97% achieving "very good" or "excellent" weight loss (>50% EWL). At the time of the study (mean 4.2 years postsurgery), participants had maintained a mean EWL of 70%, with 84% reporting very good or excellent weight loss. At the time of surgery, mean excess weight was 182 lb with a range of 73–446 lb. Presurgical excess weight was significantly correlated with %EWL at present ($r = -0.17$, $P < 0.01$), but not with weight regain at present. The range of maximum postsurgical weight loss before regain was 44–357 lb with a mean of 145 lb.

Table 2 Weight change outcomes in postgastric bypass patients

BAROS postsurgical weight-loss outcomes ^a (%EWL)	Excess weight loss present % (N)	Excess weight loss initial (max) % (N)
Excellent (75–100%)	46 (231)	68 (339)
Very good (50–74%)	38 (187)	29 (146)
Good (25–49%)	14 (69)	3 (12)
Fair (0–24%)	2 (9)	Excluded
Poor (weight regain)	<1 (1)	Excluded

^aBariatric analysis and reporting outcome system.

Table 3 % Excess weight loss (EWL) regained postgastric bypass surgery (N = 497)

Reported EWL regain	Participants
≤0%	14% (n = 69)
>0 to <10%	39% (n = 194)
≥10 to <20%	33% (n = 164)
≥20 to <30%	8% (n = 39)
≥30 to <40%	4% (n = 20)
≥40 to <50%	<1% (n = 5)
≥50%	1% (n = 6)

At the time of the study, the weight changes from before surgery ranged from a gain of 6 lb to a loss of 335 lb, with a mean weight loss of 126 lb (mean decrease of 70% EWL, ranging from a 3.6% increase to 111% decrease). Maximum postsurgical weight loss, defined as the lowest weight following surgery, before any weight regain, was achieved on average at 17.9 months following surgery. Time since surgery was not related to overall %EWL. There was, however, a significant correlation between time since surgery and weight regain ($r = 0.192, P < 0.01$)

Following maximum postsurgical weight loss, 430 subjects (87%) reported weight regain ranging from 1 to 124 lb (mean 22.6 lb): 55 respondents (11%) reported no regain and 11 respondents (2%) reported an additional weight loss. Fourteen percent of participants reported no regain of %EWL, 39% reported >0 to <10% regain of %EWL, 33% of participants reported ≥10 and <20% EWL (%) regain, and ~14% of participants reported regain of ≥20% of EWL (%). Weight outcomes are provided in [Tables 2](#) and [3](#).

Bingeing, grazing, and loss of control

Half of all participants ($n = 248, 49.9%$) reported experiencing times when they could not stop eating or control how much they were eating. One hundred thirty-five participants (27%) reported that they also consumed what most people would regard as a large amount of food and/or what most people would regard as a large amount of food for someone who has had weight-loss surgery. Of those who reported binge eating, 87 met the modified *DSM-IV* criteria for BED (18%). An additional 13 met criteria for BED with a subthreshold frequency (binge eating <2 times per week).

Table 4 Correlations of grazing, loss of control, and binge eating with current excess weight loss and weight regain in postgastric bypass patients

Eating pattern (frequency)	Current excess weight loss ^a (r (N, significance))	Weight regain (r) (N, significance)
Grazing	-0.27 (234, $P < 0.001$)	0.39 (233, $P < 0.001$)
Binge eating	-0.21 (135, $P = 0.013$)	0.24 (133, $P = 0.006$)
Loss of control	-0.41 (113, $P < 0.001$)	0.36 (112, $P < 0.001$)

^a% Excess weight loss (% EWL).

We found a significant relationship between loss of control when eating and EWL ($r = -0.41, P < 0.001$), and loss of control and weight regain ($r = 0.36, P < 0.001$), in the predicted directions ([Table 4](#)). BE frequency and %EWL were also significantly related ($r = -0.21, P = 0.013$), as was BE frequency and weight regain ($r = 0.24, P = 0.006$), also in the predicted directions. We also controlled for percent excess weight at presurgical baseline that was independently related to %EWL, and binge frequency continued to be significantly related to %EWL ($r = -0.36, P < 0.001$). Significant differences in EWL ($t = 8.1, P = 0.001$) and regain ($t = -8.2, P = 0.001$) between participants meeting criteria for modified BED and those who did not was also found. Participants who met criteria for BED regained more weight and had lesser overall EWL than those without modified BED.

Approximately half of all respondents (46.6%, $n = 234$) reported that they often eat or nibble continuously over an extended period of time, and feel that this eating is out of control. Of these, 169 (34%) do so ≥2 days a week. As predicted, frequency of grazing was positively correlated with weight regain ($r = 0.39, P < 0.001$) and negatively correlated with %EWL ($r = -0.27, P < 0.001$). We controlled percent excess weight at presurgical baseline, which was independently related to %EWL, and graze frequency continued to be significantly related to %EWL ($r = -0.28, P < 0.01$). Participants who reported grazing at least two times a week had greater weight regain ($t = -6.6, P < 0.001$) and less EWL ($t = 6.8, P < 0.001$) than those who grazed on a less regular basis.

Health-related quality of life

Health-related quality of life ($M = 0.92, s.d. = 1.2$) was negatively correlated with weight regain ($r = -0.35, P < 0.001$) and positively correlated with %EWL ($r = 0.39, P < 0.001$). Partial correlations were analyzed, controlling for weight regain and %EWL. We also examined the relationship between eating behaviors and quality of life while controlling for weight outcomes. Participants who met the criteria for BED reported significantly poorer quality of life than those who did not meet criteria ($t[463] = 9.7, P < 0.001$). Participants who reported grazing >2 times per week reported significantly poorer quality of life than those who did not meet these criteria ($t[361] = 9.0, P < 0.001$).

Weight regain, eating patterns, and health-related quality of life

Participants who regained >10% of their EWL following surgery reported significantly higher frequencies of binge eating,

($t[133] = 2.3, P = 0.03$), grazing ($t[230] = 4.6, P < 0.001$), and loss of control ($t[111] = 3.8, P < 0.001$) as well as significantly lower quality of life ratings than those who regained 10% EWL or less ($t[495] = -6.8, P < 0.001$).

DISCUSSION

The purpose of the study was to assess the weight outcomes, eating behaviors, and perceived quality of life of individuals 3–10 years following GBP. Participants reported significant weight loss and positive weight outcomes postsurgically, as well as significant weight regain beginning around 2 years postsurgery. In accordance with prior research, the present study found a notable loss of control when eating as manifested in binge eating and grazing following surgery (11,17). Additionally, participants reported a high prevalence of consumption of subjectively large quantities of food that would not be expected in a postsurgical population.

Binge eating and grazing 3–10 years following surgery was reported by a large number of participants, and the frequency of these behaviors predicted both greater weight regain and lesser %EWL. In light of the physical limitations of the stomach following surgery, some studies eliminate the BED criteria of consumption of large quantities of food when assessing BED in this population (10). However, in our study, 13% reported that they often consumed what most people would regard as an unusually large amount of food, and an additional 26% reported that they often consumed what most people would regard as an unusually large amount of food for someone who has had weight-loss surgery.

Notably, 18% percent of participants met the modified criteria for BED. This was higher than expected, suggesting that postsurgical participants are either able to expand stomach capacity over time, or report inaccurate perceptions of the relative quantities of food they or others are able to consume. However, these participants had a greater mean weight regain and lesser %EWL than those who did not endorse eating subjectively large quantities, suggesting that their perceptions of food consumption relative to that of others may be accurate. Most striking, however, was the number of participants who reported a loss of control when eating. Half of all respondents reported that they often had periods of time when they felt they could not stop eating or control how much they were eating during the past 6 months. The frequency of experiencing a loss of control during eating was associated with poorer weight outcomes. Previous studies of long-term outcomes found similar associations between loss of control eating and weight regain, yet the prevalence in our study is higher than that seen in most studies (6,11,14). Our findings suggest that a sense of loss of control over eating appears to be a significant issue following surgery. This loss of control may be the core of the maladaptive eating behaviors of grazing and binge eating also reported in this study, and warrants further study.

Grazing was endorsed by 47% of participants and was characterized by eating small amounts continuously over an extended period of time with associated feelings of loss of control. Although there is limited research on this proposed

maladaptive eating behavior, it has been suggested that following GBP, disordered eating and loss of control over eating is more easily expressed in the form of grazing rather than bingeing. Increased grazing frequency was associated with greater weight regain and lesser %EWL, as predicted. Poorer weight outcomes were found between those who met criteria for a “grazing disorder” (grazing ≥ 2 times per week) and those who did not. Specifically, individuals who engage in grazing behaviors after surgery reported poorer %EWL and larger weight regain than those who did not. Multiple definitions of grazing exist in the literature, and some consider this behavior an adaptive eating style that promotes weight maintenance. This study suggests that a loss of control when eating, grazing, and BED are problems several years after surgery and appear to be related to poorer weight outcomes. More specifically, individuals who regained $>10\%$ of their EWL reported significantly higher frequencies of binge eating, grazing, and loss of control while eating.

We also found that the frequency of binge eating and grazing was negatively correlated with perceived quality of life following surgery. Regardless of overall weight loss or weight regain, participants reported lower quality of life with increased binge and grazing frequency, suggesting that these behaviors not only impact weight outcomes but psychosocial outcomes as well. The psychological benefits of bingeing and grazing postsurgery warrants further exploration but are likely a manifestation of participants’ presurgical relationship with food, and may involve feelings of comfort and a reduction of anxiety.

There were several limitations of the current study. Recruitment was conducted through a Web site that provides information and support about weight-loss surgery. As such, respondents to the survey are individuals who continue to seek information or support >3 years postsurgery and may not represent the greater postsurgical population. These individuals may have better surgical outcomes as a result of their continued engagement in the process, or may be struggling with postsurgical difficulties and seeking help. Although the demographics of Internet users is rapidly approaching the demographics of the general population, the average income and education of Internet users remains higher than that of the general population (32). In this study, 96.5% of participants were female and 90% white, also potentially jeopardizing the generalizability of these findings. All data were collected through self-report measures and subject to associated biases. Self-report data can be subject to response distortions and to inaccuracy. Notably, participants provided historical and current weight data, which tends to be underreported in women when self-reported (33). Finally, although the majority of participants were between 3 and 5 years postsurgery, more longer-term data (≥ 7 years) was only available for 17 participants.

The relationship between loss of control eating behaviors, binge eating and grazing suggests a need for greater understanding and elucidation of the diagnostic criteria for eating disorders, as well as that of maladaptive eating behaviors following surgery. In our study, participants who did not meet full criteria for BED still reported poorer quality of life as well

as weight regain associated with feelings that their eating was out of control. Loss of control, a key component of both binge eating and grazing, may represent the underlying mechanism that leads to these behaviors. Prospective, long-term studies on eating patterns, disorders, and weight outcomes would yield much needed information on the timing of changes in eating patterns, as well as the relationships between pre- and postsurgical eating behaviors and outcomes.

DISCLOSURE

The authors declared no conflict of interest.

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