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Post-Operative Marijuana Use and Disordered Eating among Bariatric Surgery Patients

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Abstract

Background—Current literature is scarce in documenting marijuana use after bariatric weight loss surgery (WLS).

Objectives—The objective of this study was to explore the association between marijuana use patterns, disordered eating and food addiction behaviors among patients two years post-WLS.

Setting—University Hospital, United States.

Methods—Participants (N=50, mean age 28, SD=5.8) were administered a structured assessment that included the Addiction Severity Index (ASI), Yale Food Addiction Scale, Eating Disorder Examination Questionnaire (EDE-Q), and Disordered Eating Questionnaire (DEQ). Marijuana use was defined based on the ASI as current use (within 30 days), recent use (use in last year), and increased use (increased use since surgery). Data were analyzed using Fisher's Exact Tests and Linear Regression methods adjusting for age, gender, race/ethnicity, time since surgery, and change in Body Mass Index.

Results—The majority of the sample was female (76%) and underwent the Roux-en-Y Gastric Bypass procedure (62%). Eighteen percent (18%) of the sample reported current marijuana use; 38% reported recent use; and 21.4% reported increased use post-WLS. A loss of controlled food intake was associated with current ($p=0.02$) and increased post-WLS use ($p=0.01$). Increased use and/or regular marijuana use predicted higher scores on eating disorder subscales compared to

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No Conflicts of Interest to Report

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respective counterparts ($p<0.05$). Current use did not significantly predict higher scores on the Yale Food Addiction Scale.

Conclusions—Findings show marijuana use in post-WLS patients despite recommendations against use. A subgroup of WLS patients may be at risk for disordered eating post-WLS, particularly those who used marijuana before surgery and should be closely monitored for several years post-WLS.

Keywords

marijuana; food addiction; disordered eating; bariatric surgery; weight loss surgery

Introduction

Bariatric surgery has been documented as an effective treatment for morbid obesity in the United States ⁽¹⁾, where more than one-third of the population is obese ^(2, 3). Studies have reported a notable prevalence of psychiatric disorders among bariatric surgery candidates such as binge eating disorder ^(4, 5) and lifetime substance use disorder ⁽⁶⁾. Despite pre-surgical diagnoses, successful surgical weight loss and comorbidity resolutions are more likely to occur in patients who adhere to lifestyle modifications proposed by surgeons, such as quality diet intake and the avoidance of drug use post-surgery ^(7, 8).

Marijuana is the most commonly used illicit drug in the United States ⁽⁹⁾; yet, it has been noted that there are no studies published that examine the prevalence nor effect of marijuana use among bariatric surgery patients ⁽¹⁰⁾. Although the relationship between marijuana use and physical health outcomes is unclear, marijuana use has been documented to increase appetite, heart rate, respiratory infections, and immune suppression ⁽¹¹⁾. Such outcomes are similar to the factors that may lead to negative post-surgical outcomes among bariatric surgery patients ^(10, 11). Psychiatric comorbidities such as depression and anxiety have also been documented among marijuana users which increases negative post-surgical outcomes among bariatric surgery patients ⁽¹⁰⁾. Aside from negative health outcomes, marijuana use has also been associated with a higher relapse of alcohol and other drugs ^(10, 12) which can lead to other negative consequences post-surgery. Many bariatric surgery facilities advise patients to avoid alcohol consumption for six months after surgery to facilitate post-surgical healing weight loss and to prevent macro-nutrient deficiencies ⁽⁸⁾. Furthermore, studies ranging from animal models ^(13, 14) to human patients ^(15, 16) have shown an increase in alcohol use post-surgery.

Research suggests that there are instances in which patients develop new onset substance use disorders after surgery, potentially substituting licit (i.e., alcohol, cigarettes) or illicit substances (i.e., drugs) for food ⁽¹⁷⁻²⁰⁾. It should be noted that general assumptions should not be made since individual differences among patients should be considered when determining who has the potential to become “addicted” to substances ⁽²¹⁾, whether it be food or drugs. Bariatric surgery patients have also been shown to be overrepresented in substance abuse treatment programs ⁽²²⁾. For example, Conason et al. (2013) ⁽²³⁾ found that 4.5% of weight loss surgery patients reported drug use (independent of alcohol and cigarette use) at baseline. Two years post-surgery, the prevalence increased to 13.2%; however, the

substance(s) used are not specified. A study of Veterans who underwent weight loss surgery reported that 4% of patients developed substance abuse disorder post-surgery. The substances reported in this study were alcohol and methamphetamines⁽²⁴⁾. Though there may be a subset of weight loss surgery patients who engage in substance use post-surgery, based on the current literature, the specific substance aside from alcohol and tobacco are not clear. New onset substance use disorder diagnoses place most substances into general categories such as alcohol, tobacco and other drugs⁽¹⁰⁾. This makes it difficult to focus on specific types of substances, such as marijuana, independently. Furthermore, eating behaviors post-surgery are not described in detail among such patients.

Given that marijuana use has been connected to risk behaviors that lead to negative post-surgical outcomes, we explored the frequency of marijuana use in a sample of post-bariatric surgery patients. Specifically, there is a gap in the literature reporting the prevalence of postoperative marijuana use patterns among bariatric surgery patients. The objective of this study was to explore the marijuana use patterns, disordered eating behavior, and food addiction behaviors among patients 1-2 years after bariatric weight loss surgery (WLS). It was hypothesized that patients who engage in marijuana use post-WLS would exhibit disordered eating behaviors when compared to those who never used marijuana.

Methods

Recruitment

Patients, recruited from a larger study that examined psychosocial and health outcomes of teen and young adult bariatric surgery patients, were eligible for the current study if they were at least one year post-operative. Initial contact was made over the phone or through email based on contact information via a patient database. Interested participants were scheduled for an interview with a trained licensed master's or doctoral level clinician. After study procedures were explained, written informed consent was obtained prior to the in-person interview. There was only one participant under age 18 (participant was 17 years old). Written informed assent was obtained from the minor participant and written consent was obtained from their parent/guardian. The interviews lasted approximately two to three hours. Participants were compensated \$100 for their time. The University of Miami's Institutional Review Board (IRB) approved all study procedures.

Measures

Marijuana Use—The drug/alcohol portion of the Addiction Severity Index (ASI) 5th Edition⁽²⁵⁾ was administered by the interviewer to assess marijuana use. The ASI captures lifetime and past 30-day use of alcohol and other drugs, including marijuana. Lifetime use was used to assess whether or not the patient used marijuana before surgery based on reported age of first use of marijuana. In accordance with the ASI Manual and Question by Question guide⁽²⁶⁾, the following question regarding pattern of use in the last year “In the past 12-months, have you used marijuana?”; and a specific question regarding pattern of use since WLS “Since surgery, how would you describe your marijuana use pattern (answer options: increased since surgery, stayed the same, decreased since surgery)” were added.

The authors of the manual encourage the addition of specific questions, but discourage the removal of specific questions within a section.

Eating Behavior—Eating behaviors were assessed using the (1) Eating Disorders Examination Questionnaire (EDE-Q) ⁽²⁷⁾. Disordered eating was assessed using a Disordered Eating Questionnaire (DEQ) designed for the current study based on questions adapted from the Stunkard-Messick Eating Questionnaire (1985) ⁽²⁸⁾ and the Night Eating Questionnaire ⁽²⁹⁾. Both questionnaires were interviewer-administered. The EDE-Q is a 41-item measure that assesses feelings and behaviors surrounding eating and body image within the past 28 days. The EDE-Q contains a global score and four subscales: restraint, eating concerns, weight concerns, and shape concerns that reflect the severity of the psychopathology of eating disorders ⁽²⁷⁾. The DEQ is an 11-item measure that assessed emotional eating and night eating both before and after surgery. Emotional and night eating before surgery was measured retrospectively using this measure.

Food Addiction—Food addiction was assessed using the Yale Food Addiction Scale (YFAS) ⁽³⁰⁾, a 27-item questionnaire that was administered by the interviewer to examine behaviors representative of food addiction within the past 12 months. Questions were modeled to parallel symptoms for DSM-IV-R defined substance dependence such as loss of control, unsuccessful attempts to quit overeating, too much time spent to obtain food, skipping important activities for food, increased tolerance, and food eaten to relieve withdrawal ⁽³⁰⁾. The YFAS has been validated with college students ⁽³¹⁾, among individuals with obesity and binge eating behaviors ⁽³²⁾, and post-bariatric surgery patients ⁽³³⁾. In the current study, the YFAS was administered post-operatively only; thus, food addiction data were not obtained prior to bariatric surgery.

Covariates—Covariates were age, gender, race/ethnicity, time since surgery, and pre-/post-WLS change in Body Mass Index (BMI). A demographic questionnaire was administered to patients as part of the enrollment to the study to capture age (in years), self-report male/female for gender, and race/ethnicity (Hispanic, Non-Hispanic Black, Non-Hispanic White, or other). The time since surgery was calculated based on the date of the interview and surgery date collected from medical records. Change in BMI was calculated based on pre-surgical and post-surgical BMI listed in medical records.

Statistical Analysis

The sample was analyzed using Statistical Analytic Software (SAS) version 9.3 (SAS Institute, Inc., Cary, North Carolina). Marijuana use patterns were defined as follows: 1) Never used (no reported lifetime use); 2) Current marijuana use (any report of use in last 30-days); 3) Recent marijuana use (use in last year, but not past 30-days); and 4) Increased marijuana use since surgery. YFAS and EDE-Q scoring instructions were utilized to create scores for respective subscales and composite scores. Frequencies and Fisher's exact tests were used to compare descriptive characteristics as well as prevalence estimates of marijuana use patterns. Linear regression models adjusting for age, gender, race/ethnicity, time since surgery, and change in BMI were estimated. A p-value of <0.05 was considered statistically significant.

Results

Participants

The majority of the sample (N=50) was female (76%) and underwent the Roux-en-Y Gastric Bypass procedure (62%). Hispanics represented 56% of the sample, followed by non-Hispanic Blacks (34%) and Non-Hispanic Whites (10%). Over half (54%) have never been married. Participants ranged between the ages 17-to-38 years. The average age was 28 years (SD=5.8), median was 29 years, and average time since surgery was 2.1 years (SD=1.1). Among the overall sample, the mean BMI dropped to 35.2 kg/m² post-WLS compared to 49.1 kg/m² pre-WLS. Participant characteristics are detailed in Table 1.

Prevalence of Marijuana Use

More than half of the overall sample (56.0%) reported marijuana use in their lifetime. Almost a third (32.1%) of those who have engaged in marijuana use reported current use (within the last 30-days) and 67.9% reported recent use within the last year. Twenty one percent (21.4%) of those with reported marijuana use pre-WLS reported increased marijuana use post-WLS.

Prevalence of Food Addiction

No History of Marijuana Use—Table 2 presents the prevalence of each food dependence criterion by marijuana use category. Among the patients who never used marijuana (44% of sample), none reported a loss of control over food intake. The majority (68.2%, n=15) of patients without report of marijuana use had unsuccessful attempts to quit overeating. About 9% (n=2) of those who never used marijuana spent too much time obtaining food, ate food to relieve food withdrawal symptoms, had an increased tolerance, and met the YFAS criteria for food addiction.

Marijuana Users—Patients who reported marijuana use in the last 30-days had a higher prevalence of loss of control in regard to food intake (22%, n=2) compared to patients who did not use marijuana in the last 30-days (5.3%, n=1, p=0.02). Among patients who reported marijuana use in the last 30-days, 77.8% (n=7) had unsuccessful attempts to quit overconsumption of food. Twenty two percent (22.2%, n=2) of current users reported spending too much time obtaining food, an increased tolerance to food, and reported eating food to relieve withdrawal symptoms.

The majority of recent marijuana users (84.2%, n=16) and those with increased use after WLS (83.3%, n=5) reported unsuccessful attempts to quit overeating. Almost a third (31.6%, n=6) of recent marijuana users demonstrated symptoms of food addiction. Over a quarter (26%, n=5) ate food to relieve withdrawal, spent too much time to obtain food, and had an increased tolerance of food. Patients who reported increased marijuana use after surgery had a significantly higher prevalence of loss of control of food intake (33.3%, n=2) when compared to those without increased use (4.5%, n=1) or no use ever (0.0%, n=0) (p=0.01). Half of the patients with increased marijuana use spent too much time obtaining food. A third (33%, n=2) had increased tolerance of food, ate food to relieve withdrawal, and met the YFAS criteria for food addiction.

Prevalence of Disordered Eating Behaviors and Marijuana Use

Current marijuana users had a higher prevalence of snacking in the middle of the night (42.9%, $n=3$) compared to 10.0% ($n=2$) of never users ($p=0.03$). Over half (57.1%, $n=5$) of current marijuana users ate when they felt bored compared to 33.3% ($n=4$) of never users ($p=0.04$). A significantly higher proportion of current marijuana users reported eating when they felt lonely compared to never users (42.9%, $n=3$ vs. 4.8% ($n=1$), respectively, $p=0.02$). Twenty eight percent (28.5%, $n=2$) of current marijuana users reported eating to relax when anxious compared to 14.3% ($n=3$) of never users ($p=0.05$). Among recent marijuana users, 41.2% ($n=7$) reported eating when lonely compared to 4.8% ($n=1$) of never users ($p=0.02$). Reports of eating when bored and eating to relax when anxious were marginally significantly higher among recent marijuana users (70.6%, $n=12$ and 47.1%, $n=8$, respectively) compared to never users (33.3%, $n=7$ and 14.3%, $n=3$, respectively) (both p 's=0.06). The majority of patients with increased marijuana use post-WLS reported that they eat to relax when anxious (60%, $n=3$) compared to 14.3% ($n=3$) of never users ($p=0.02$). Forty percent (40.0%, $n=2$) of patients reporting an increase in use eat when they feel lonely compared to 4.8% ($n=1$) of never users ($p=0.02$).

Marijuana Use as Predictors for Eating Disorder Examination Subscales

Increased marijuana use post-WLS predicted higher scores in nearly all categories of disordered eating when compared to never users. Specifically, patients with increased marijuana use post-WLS had higher weight concern ($\beta=2.40$; $p=0.02$), shape concern ($\beta=2.45$; $p=0.04$), eating concern ($\beta=2.50$; $p=0.004$), and a higher EDE-Q Global score ($\beta=2.07$; $p=0.02$) than patients that never used marijuana. Similar results were found among patients with reported recent marijuana use. Such patients had higher scores for all eating disorder subscales: weight concern ($\beta=1.70$; $p=0.01$), shape concern ($\beta=1.80$; $p=0.02$), eating concern ($\beta=1.26$; $p=0.03$), restraint ($\beta=1.62$; $p=0.01$) and EDE-Q Global score ($\beta=1.60$; $p=0.004$) when compared to those who have never used marijuana. Increased and recent marijuana users also had significantly higher Yale Food Addiction scores ($\beta=2.24$; $p=0.03$; and $\beta=1.42$; $p=0.03$, respectively) when compared to those who have never used marijuana. Current marijuana users did not present with significantly ($p<0.05$) higher scores in any of the eating disorder subscales except for restraint ($\beta=1.73$; $p=0.05$) nor Yale Food Addiction scale (Table 3).

An analysis of only patients that reported marijuana use was conducted (Table 4). Patients who reported increased marijuana post-WLS reported higher scores on the following eating disorder subscales: weight concern ($\beta=1.95$; $p=0.01$), shape concern ($\beta=2.09$; $p=0.02$), eating concern ($\beta=2.00$; $p=0.001$), and EDE-Q Global score ($\beta=1.62$; $p=0.01$) when compared to those who did not report increased marijuana use post-WLS. Increased marijuana users had a higher Yale Food Addiction score than those who did not report increased marijuana use. Recent marijuana users had higher scores on all eating disorder subscales. Specifically, weight concern ($\beta=1.60$; $p=0.004$), shape concern ($\beta=1.71$; $p=0.01$), eating concern ($\beta=1.03$; $p=0.03$), restraint ($\beta=1.93$; $p=0.001$), and EDE-Q Global score ($\beta=1.57$; $p=0.001$) compared to those without recent marijuana use. Furthermore, recent marijuana users had a higher Yale Food Addiction score than those who did not report

recent marijuana use. Current marijuana users did not present with significantly higher eating disorder scores than non-current users.

Discussion

Findings suggest that there is a subset of patients who engage in marijuana use post-WLS despite recommendations against the behavior. Moreover, of the patients who reported use pre-WLS, almost a third (32.1%) reported current marijuana use and the majority (67.9%) reported recent use post-WLS. Twenty percent reported increased use post-WLS. The prevalence of current marijuana use among our sample of bariatric patients is higher than US prevalence estimates. Specifically, among adults 26 or older, only 5.6% reported past month marijuana use in the US⁽⁹⁾ compared to the 18% of our sample.

At the time of the current study, no other published studies have examined the prevalence of marijuana among WLS patients or the relationship between marijuana use and disordered eating behaviors post-WLS. In fact, it has been noted that no research to date has explored the effects of marijuana use post-WLS⁽¹⁰⁾. While there are studies that examine the prevalence of substance use post-WLS, marijuana is usually included in the “other drug” category along with illicit substances such as heroin, cocaine, and methamphetamines. Our study contributes prevalence estimates of marijuana use patterns and disordered eating behavior among such patients to the literature.

Despite the limited literature on the topic of marijuana use and disordered eating behavior post-WLS, there is a study that was conducted among post-WLS patients in substance abuse treatment that indicated 12.5% of patients were abusing marijuana upon admission⁽¹⁹⁾. The average length of time since surgery in that study was 5.5 (SD: 3.1) years and the mean age was 45.2 (SD: 10.0) years. However, the definition of substance abuse extends that of which was used to define marijuana use in the current study. We examined current, recent, and increased use, not a diagnosis of abuse as used in Ivezaj et al (2012)⁽¹⁹⁾. Furthermore, our study examined the behaviors of patients at an average of 2 years post-WLS. It is unknown whether or not those with reported marijuana use at the 2 year time-point would develop into a diagnosis of marijuana abuse at 5.5 years (the average time post-WLS of the Ivezaj et al. 2012)⁽¹⁹⁾.

In our study, increased and/or recent marijuana use was found to predict higher scores on all of the eating disorder subscales of the EDE-Q (weight concern, shape concern, eating concern, restraint and global) as well as the overall criteria to qualify as food addiction on the YFAS. Data also suggest that patients who reported marijuana use may also be at increased risk for specific food addiction criteria such as loss of control over food intake after surgery. A potential explanation for the higher scores among increased and recent marijuana users on all eating disorder subscales when compared to never users may be related to their loss of control over food. Results from our study show that increased marijuana users had a higher prevalence of loss of control over food intake when compared to patients without increased use. Perhaps the loss of control of food intake is leading to higher vulnerability to relapse into poor eating behaviors. The loss of control over food intake has been found to be a prospective predictor of significant negative post-surgical

outcomes at 12- and 24-months post-WLS⁽³⁴⁾. Furthermore, post-WLS patient problematic intake of food and the development of substance use disorders has been examined by White et al. 2010⁽¹⁷⁾. The study used the problematic food list included in the YFAS and found that patients who reported high problematic food intake pre-WLS were at greater risk for new onset substance use post-WLS⁽¹⁷⁾. Substance use was assessed by the Michigan Assessment Screening Test for Alcohol and Drugs (MAST-AD) and did not differentiate between specific substances. Another possible explanation could be overall impulse control, which was not measured in the current study. Future studies may want to consider examining the loss of controlled food intake and impulse control in relation to the long term use of marijuana post-WLS.

The current study found that current (last 30-day) marijuana use did not predict higher scores on the eating disorder subscales based on behavior in the last 28 days. This finding is particularly intriguing given the concept of “addiction transfer”, substituting one addiction to one substance to another^(17, 18, 20, 35) in that such patients may be replacing the disordered use of food with marijuana. A possible explanation for these findings could be that patients who engage in current marijuana use satisfy the “addiction” with marijuana, thus not engaging in disordered eating behaviors. Our findings may generate preliminary evidence for future studies to look closer at this transfer and potential interventions since the reported use of both substances (food and marijuana) at the same time were not significantly related. This is further shown by comparing the prevalence of individual food dependence criterion between current and non-current marijuana users in our study. Qualitative data from Ivezaj et al.'s⁽¹⁹⁾ study of patients enrolled in substance abuse treatment reveal themes of substance abuse development post-WLS. The majority of that sample (83%) indicated a theme of addiction substitution defined as any mention of replacing one behavior or substance for another; 71% discussed the recommendation of increasing knowledge regarding associated risks of substance abuse post-WLS⁽¹⁹⁾. However, consistent with other studies, the majority of patients who provided qualitative data reported alcohol as the substance used.

Limitations

This study is not without its limitations. First, the data were collected retrospectively which may lead to recall bias and underestimation of prevalence. However, other data such as the ASI and the EDE-Q measure behavior in the last 30- or 28-days were current. Second, we do not have pre-WLS frequency of marijuana use nor food addiction (YFAS) data to make comparisons among marijuana use categories. The current study is cross-sectional in analysis thus cannot determine any causal relationships. Our study serves as a hypothesis generating study so future studies may want to consider collecting more detailed pre- and post-data on food addiction, disordered eating, and marijuana use. In addition, the current study has a relatively small sample size (N=50); however, it is noteworthy that significant effects were found despite the small sample size. The current study did not look at specific relationships between pre-surgical BMI, post-surgical BMI, or BMI change as it relates to marijuana use patterns and disordered eating behavior. Future studies should consider taking a closer look into these relationships to determine possible relationships. Finally, future

studies should also consider poly-substance use (such as the use of alcohol along with marijuana) post-WLS.

Conclusion

Findings in the current study may generate evidence for future studies to closer examine marijuana use patterns and disordered eating in post-WLS patients. Data suggest patients who report increased marijuana use post-WLS may also be at increased risk for more disordered eating habits after surgery. Findings may inform professional practices in that clinicians may want to ask about specific substance use (alcohol, marijuana, etc.) rather than a general substance use question. If a patient reports pre-WLS use, perhaps a suggestion to cease activity, as done with alcohol, should be given to the patient with an explanation that increased disordered eating behaviors may occur. These patients should be closely monitored long-term after post-WLS.

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Table 1
Demographic and Clinical Characteristics of Bariatric Surgery Patients

Characteristic	Overall Sample N (%)	Never Used Marijuana n=22 n (%)	Marijuana Use in Last 30-days n=9 n (%)	P [†]	Recent Marijuana Use n=19 n (%)	P ^{††}	Increased Marijuana Use Since Surgery n=6 n (%)	P ^{†††}
Gender				0.05		0.76		0.65
Male	12 (24.0)	2 (9.1)	2 (22.2)		5 (26.3)		1 (16.7)	
Female	38 (76.0)	20 (90.9)	7 (77.8)		14 (73.7)		5 (83.3)	
Race				0.42		0.45		0.11
Hispanic	28 (56.0)	11 (50.0)	5 (55.6)		11 (57.9)		3 (50.0)	
Non-Hispanic Black	17 (34.0)	10 (45.5)	2 (22.2)		5 (26.3)		1 (16.7)	
Non-Hispanic White	5 (10.0)	1 (4.5)	2 (22.2)		3 (15.8)		2 (33.3)	
Currently Employed	33 (68.8)	14 (66.7)	3 (33.3)	0.01	11 (61.1)	0.52	2 (33.3)	0.07
Marital Status				0.71		0.20		0.01
Married	20 (41.6)	9 (45.0)	3 (33.3)		7 (36.8)		1 (16.7)	
Divorced	2 (4.2)	0 (0)	1 (11.1)		2 (10.5)		2 (33.3)	
Never Married	26 (54.2)	11 (55.0)	5 (55.6)		10 (52.6)		3 (50.0)	
Surgery Type				0.33		0.28		0.11
Sleeve Gastrectomy	13 (26.0)	8 (36.4)	1 (11.1)		5 (26.3)		0	
Roux-en-Y Gastric Bypass	31 (62.0)	13 (59.1)	7 (77.8)		10 (52.6)		4 (66.7)	
Adjustable Band Gastroplasty	6 (12.0)	1 (4.5)	1 (11.1)		4 (21.1)		2 (33.3)	
	Mean (SD)	Mean (SD)	Mean (SD)		Mean (SD)		Mean (SD)	
Age (years)	28.04 (5.8)	27.1 (5.5)	28.5 (5.8)	0.81	27.5 (5.6)	0.66	25.3 (6.4)	0.23
Time Since Surgery (years)	2.11 (1.12)	1.75 (0.97)	2.3 (1.5)	0.46	2.6 (1.3)	0.01	3.2 (1.1)	0.02
Pre-Surgical Body Mass Index	49.1 (12.7)	46.6 (8.9)	60.4 (21.7)	0.01	53.3 (18.1)	0.02	46.0 (5.8)	0.11
Post-Surgical Body Mass Index	35.2 (10.4)	35.3 (15.7)	39.6 (15.7)	0.21	37.0 (12.5)	0.53	30.4 (3.9)	0.06

[†] Compared to those who did not report marijuana use in last 30-days (Fisher's Exact Test)

^{††} Compared to those who did not report regular marijuana use in lifetime (Fisher's Exact Test)

^{†††} Compared to those who did not report increased marijuana use after surgery (Fisher's Exact Test)

Table 2
Prevalence of Yale Food Dependence Criteria among Bariatric Surgery Patients by Marijuana Use Category

Yale Food Dependence Criteria	Never Used Marijuana n=22 n (%)	No Current Marijuana Use n=19 n (%)	Current Marijuana Use n=9 n (%)	P-value [†]	No Recent Marijuana Use n=9 n (%)	Recent Marijuana Use n=19 n (%)	P-value [†]	No Increased Marijuana Use Since Surgery n=22 n (%)	Increased Marijuana Use Since Surgery n=6 n (%)	P-value [†]
Loss of Control	-	1 (5.3)	2 (22.2)	0.02	1 (11.1)	2 (10.5)	0.28	1 (4.5)	2 (33.3)	0.01
Unsuccessful Attempts to Quit	15 (68.2)	16 (84.2)	7 (77.8)	0.48	7 (77.8)	16 (84.2)	0.48	18 (81.8)	5 (83.3)	0.51
Too Much Time Spent to Obtain Food	2 (9.1)	5 (26.3)	2 (22.2)	0.34	2 (22.2)	5 (26.3)	0.33	4 (18.2)	3 (50.0)	0.07
Skip Important Activities	1 (4.5)	1 (5.3)	1 (11.1)	0.77	1 (11.1)	1 (5.3)	0.77	1 (4.5)	1 (16.7)	0.50
Increased Tolerance	2 (9.1)	6 (31.6)	2 (22.2)	0.19	3 (33.3)	5 (26.3)	0.21	6 (27.3)	2 (33.3)	0.22
Food Eaten to Relieve Withdrawal	2 (9.1)	4 (21.1)	2 (22.2)	0.49	1 (11.1)	5 (26.3)	0.29	4 (18.2)	2 (33.3)	0.33
Diagnosis of Food Addiction/Dependence	2 (9.1)	6 (31.6)	2 (22.2)	0.19	2 (22.2)	6 (31.6)	0.19	6 (27.3)	2 (33.3)	0.21

[†] Comparing prevalence across never used, no current use, and current use (Fisher's Exact Test)

^{††} Comparing prevalence across never used, no regular use, and regular use (Fisher's Exact Test)

^{†††} Comparing prevalence across never used, no increased use, and increased use (Fisher's Exact Test)

Table 3
Regressions[†] of Marijuana Use Categories compared to those who Never Used Marijuana

	Current Marijuana Use REF=Never Used			Recent Marijuana Use REF=Never Used			Increased Marijuana Use REF=Never Used		
	β (parameter estimate)	Standard Error	p-value	β (parameter estimate)	Standard Error	p-value	β (parameter estimate)	Standard Error	p-value
Weight Concern	1.78	1.00	0.11	1.70	0.58	0.01	2.40	0.88	0.02
Shape Concern	1.52	1.19	0.23	1.80	0.67	0.02	2.45	1.05	0.04
Eating Concern	1.27	0.82	0.15	1.26	0.51	0.03	2.50	0.64	0.004
Restraint	1.73	0.78	0.05	1.62	0.58	0.01	0.95	0.88	0.31
EDE-Q Global Score	1.58	0.79	0.07	1.60	0.47	0.004	2.07	0.73	0.02
Yale Food Addiction Score	1.81	0.98	0.09	1.42	0.60	0.03	2.24	0.87	0.03

[†] adjusted for age, gender, race/ethnicity, time since surgery, and Body Mass Index change

Table 4
Regressions[†] of Marijuana Use Categories among Overall Sample

	Current Marijuana Use REF= No Current Use			Recent Marijuana Use REF=No Recent Use			Increased Marijuana Use REF= No Increased Use		
	β (parameter estimate)	Standard Error	p-value	β (parameter estimate)	Standard Error	p-value	β (parameter estimate)	Standard Error	p-value
Weight Concern	1.11	0.79	0.17	1.60	0.49	0.004	1.95	0.69	0.01
Shape Concern	0.81	0.92	0.39	1.71	0.56	0.01	2.09	0.80	0.02
Eating Concern	0.82	0.66	0.23	1.03	0.44	0.03	2.00	0.51	0.001
Restraint	1.51	0.83	0.08	1.93	0.49	0.001	0.43	0.88	0.63
EDE-Q Global Score	1.06	0.66	0.12	1.57	0.38	0.001	1.62	0.59	0.01
Yale Food Addiction Score	0.63	1.09	0.58	1.18	0.52	0.03	1.58	0.71	0.04

[†] adjusted for age, gender, race/ethnicity, time since surgery, and Body Mass Index change