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— CLINICAL PRACTICE AND COMMUNITY PROJECTS —

Food Preferences in Patients After Roux-en Y Gastric Bypass Surgery

A Pilot Study Examining Eating Behaviors and Weight Maintenance

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In a cross-sectional pilot study, we examined eating behaviors in patients (N = 24) approximately 6 years after gastric bypass surgery. Anthropometric measures, personal interviews, and 7 days of food records were collected. A mean body mass index of 33.7 ± 8 was reported, with 75% (18/24) sustaining a weight loss 50% or more of their excess body weight. A mean total caloric intake of 1429 ± 411 cal was reported: 43% carbohydrate, 17% protein, and 39% fat. Subjects reported “returning to old eating habits” with a diet high in liquid calories (soda, coffee drinks, sports drinks, alcohol), sweets (chocolate, cookies), convenience foods, and fast food consumption.

Key words: eating behaviors, weight loss surgery

LONG-TERM weight loss outcomes from gastric bypass surgery suggest that 75% to 80% of patients lose an estimated 65% to 70% of their excess body weight within the first 2 years after gastric bypass surgery.¹ However, sustaining a significant weight loss several years postsurgery continues to be a challenge for many patients who have

undergone weight loss surgery (WLS). A “successful” weight loss outcome has been defined as achieving and maintaining an excess weight loss of at least 50% long-term.² Preoperative weight, age, gender, socioeconomic status, nutrition follow-up compliance, surgical complications, postsurgery physical activity, and food choices all play a role in an individual’s long-term weight maintenance.³⁻⁷ Studies show that in most cases of weight loss failure, dietary noncompliance and/or an inability to change eating, social, and exercise behaviors lead to weight regain.^{2,8-12}

The amount of caloric intake and energy expenditure required to sustain a significant amount of weight loss and/or prevent weight regain remain unknown in the WLS population.¹³ According to Hill et al,¹³ consuming a few extra calories (<100 cal) without intentionally burning those extra calories can lead to a small positive energy balance and, consequently, a new steady state of weight gain. The objective of this pilot study

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was to examine eating behaviors and caloric intake among a population of patients after gastric bypass surgery who either maintained their weight loss or began to regain weight. This study uniquely focused on a rural population of WLS patients who have minimal or no face-to-face access to bariatric support services.

PROCEDURES

Participants

Study participants were recruited from rural western South Dakota through newspaper announcements. Interested individuals were screened by phone prior to an in-person interview. The inclusion criteria consisted of generally healthy ambulatory female adults at least 20 years of age. The participants must have had a standard Roux-en Y gastric bypass (RYGB) weight loss procedure at least 2 or more years prior to the study.^{1,14} Only patients who were weight stable and/or regaining weight were screened for the study.¹⁵ Exclusion criteria consisted of individuals with surgical revisions to the original RYGB procedure and other forms of WLS procedures. Pregnant and lactating women were excluded from the study. The institutional review board at South Dakota State University approved this study.

Demographic and anthropometric measures

During the in-person orientation, demographic and anthropometric measures were collected. Self-reported demographics, including presurgery weight, marital status, education level, presurgery, and current comorbidity information were collected on paper forms. As for the anthropometric measures, height was measured to the nearest 0.25 in (Frankfort Horizontal Plane Stadiometer; Continental Scale Corp, Bridgeview, Illinois) and weight was measured to the nearest 0.25 lb (Healthometer Electronic Scale; Continental Scale Corp) and then converted to kilograms. Participants wore light clothing and no

shoes during the measurements. Body mass index was calculated from the anthropometric measures as weight (kilograms) divided by height (meters squared).

Caloric intake estimates

To assess food and beverage intake, the participants were asked to keep a detailed food record for 7 consecutive days. The study participants were assigned a CalorieKing.com¹⁶ Web account and received the latest edition of The CalorieKing Calorie, Fat & Carbohydrate Counter, and The CalorieKing Food & Exercise Journal¹⁶ both to reinforce accurate data collection and to record food intake when the Internet was not immediately available. Specific instructions on recording food and beverage intake, accessing the CalorieKing.com¹⁶ Web site, usernames, and passwords were verbally explained and e-mailed to each study participant. Fast food consumption was defined as consuming 3 or more meals from locally recognized fast food restaurants per week. Finally, the participants were instructed not to change their eating behaviors or food and beverage intake during the 7-day study period. The principal investigator monitored the daily food log.

Statistical analyses

Demographic, anthropometric, and diet composition data were entered into Data Analysis & Statistical Software STATA/IC 12.¹⁷ Descriptive statistics, a paired *t* test, and regression modeling were used to describe the findings in the pilot study.

FINDINGS

Of the 26 women who began the study, 24 women completed the 7-day food record. One of the women discontinued the study because of an unanticipated surgery, and the other individual became seriously ill and was unable to record food intake. Of those who completed the study, the average number of years postsurgery was approximately 6.25 ± 2.7 years. Most of the participants were

married, had a college degree, and showed notable improvement in obesity-related comorbidities (Table 1). The RYGB procedure and follow-up care of the 24 participants occurred at 5 different surgery centers in the Midwest.

The mean total caloric intake was reported at 1429 ± 411 kcal, with a range of 728 to 2685 total cal per day (Table 2). Of those individuals who identified themselves as currently gaining weight ($n = 9$), their recorded caloric intake of approximately 1630 kcal was compared with those individuals ($n = 15$) who were sustaining a significant weight loss and consumed approximately 1343 kcal per day. The Dietary Guidelines for Americans¹⁸ recommendation of 3 to 5 servings of fruit and vegetables per day was reported in 29% (7/24) food records. The mean percentage of calories calculated from carbohydrate, protein, and fat was 43%, 17%, and 39%, respectively. Alcohol

consumption of 3 or more drinks per week was reported from 4 of 24 (17%) participants. Frequency of fast food consumption defined as 3 or more meals per week was reported in 11 of 24 (46%) food logs. Seventy-one percent (17/24) of the subjects recorded consuming 100 cal or more from beverages on a daily basis. The beverage calories reported in the food logs were predominately from specialty coffee drinks, soda, sports drinks, and alcohol, which accounted for approximately 163 cal per day or 11% (range, 4%-38%) of the total daily caloric intake. Meal frequency among the study participants varied from 3 meals and no snacks to 3 meals and 3 snacks, with no distinct pattern observed.

The self-reported maximum amount of weight lost from the sample of 24 study participants averaged 60.3 ± 24.4 kg. At 75.0 \pm 32 months postsurgery, 24 study participants

Table 1. Demographic, Anthropometric, and Comorbidity Measures of the Sample Population (N = 24)

Characteristic	Mean \pm SD	Minimum	Maximum
Age, y	51.8 \pm 10.5	30	71
Weight, kg	93.3 \pm 22.4	63.9	130.7
BMI, kg/m ²	33.7 \pm 7.5	23.1	46.7
Months postsurgery	75.0 \pm 32.4	24.0	138.0
Presurgery weight, kg	137.4 \pm 32.3	104.6	218.2
Presurgery BMI, kg/m ²	49.9 \pm 12.0	38.2	81.9
Education level, n (%)			
High school degree	5 (21)		
Undergraduate degree	7 (29)		
Postgraduate degree	7 (29)		
Technical degree	5 (21)		
Marital status, n (%)			
Married	17 (71)		
Single	7 (29)		
	Presurgery	Postsurgery	P (95% CI)
Comorbidities, n (%)			
Depression	12 (50)	6 (25)	<.005 (0.3-0.7) ^a
Diabetes	4 (17)	1 (4)	<.001 (0.2-0.32) ^a
High blood pressure	14 (58)	6 (25)	<.001 (0.38-0.78) ^a
High cholesterol	5 (21)	1 (4)	<.001 (0.05-0.37) ^a
Joint pain	15 (63)	11 (46)	.1 (0.44-0.82)
Sleep apnea	5 (21)	2 (8)	<.02 (0.05-0.37) ^a

Abbreviation: BMI, body mass index; CI, confidence interval.

^aStatistically significant finding.

Table 2. Diet Composition and Eating Behaviors of the Study Sample (N = 24)

Diet Composition	Mean \pm SD	Minimum	Maximum
Total calories	1 429 \pm 411	728	2 685
Carbohydrate, g	158.3 \pm 71.0 (43% kcal) ^a	20	348
Fiber, g	10.5 \pm 4.9	3	21
Protein, g	55.4 \pm 16.8 (17% kcal) ^a	17	95
Fat, g	61.6 \pm 27.0 (39% kcal) ^a	18	146
Saturated fat, g	19.0 \pm 9.9	3	47
Total cholesterol, mg	164.9 \pm 56.5	47.9	278.9
Selected behaviors, n (%)			
Alcohol ^b	4 (17)		
Fast food meals ^c	11 (46)		
Beverages ^d	17 (71)		
Fruit/vegetable servings ^e	7 (29)		
Pedometer (N = 23), Daily Step Count	5 490 \pm 3 271	1 380	14 110

^aPercentage of total caloric intake.

^bNumber of patients who consume 3 or more alcohol drinks per week.

^cNumber of patients who consume 3 or more fast food meals per week.

^dNumber of patients who consume more than 100 cal per day in the form of soda, specialty coffees, and sport drinks.

^eNumber of subjects who consumed 3 or more servings of fruit/vegetables per day.

had successfully sustained an average weight loss of 44.1 ± 25.3 kg. The difference between these findings shows a weight regain of 27% (16.2 ± 12.7 kg), which is comparable with the findings reported by Sjostrom et al¹⁹ in the Swedish Obese Subjects Study who followed WLS patients 10 years post-surgery. Averaging 6 years postsurgery, 88% (21/24) of the current sample of women regained more than 5 kg, yet 18 of 24 (75%) participants had successfully met the WLS criteria by sustaining 50% or more excess weight loss. On the basis of these findings, most rural women in this sample were maintaining their weight loss successfully.

DISCUSSION

The most frequently reported causes of weight regain after WLS in the scientific literature are either noncompliance of eating and exercise behaviors or an inability to change eating and exercise behaviors.^{3,6,20-23} Researchers often refer to “weight-promoting” eating behaviors in post-WLS patients as

chronically overeating, binge eating, increased snacking, and overconsumption of high calorie foods and beverages.^{6,22,24,25} Observations from the science literature are consistent with the food logs from this study sample in describing consumption of sweets, baked goods, fast foods, and convenience foods in their diet. Evidence of sweetened high calorie food choices was confirmed with the food records reporting daily consumption of bite-sized candy bars, chocolate candies, cookies, soda, and specialty coffee drinks. Breakfast sandwiches, fast food combination meals (sandwich, French fries or chips, beverage), Mexican entrees, and pizza support the observation of high calorie meals and convenience foods consumed during the 7 consecutive days of eating patterns recorded. Although the food records did show some evidence of chronic overeating with large-portion sizes,²⁶ the predominant finding was excessive consumption of calorically dense foods. Food and beverages high in fat, sugar, carbohydrate, and alcohol were noted in the long-term eating patterns in this sample of patients after gastric bypass surgery. Meal and

snack frequency reported in the food logs appeared appropriate with 3 meals and usually 1 to 2 snacks per day.²⁶

The mean total caloric intake of 1429 ± 411 kcal from this sample of women seems to be lower than other published findings.^{20,27} Warde-Kamar et al²⁰ and Kruseman and colleagues²⁷ reported an average daily caloric intake of 1733 kcal (n = 68) at approximately 2.5 years postsurgery and 1680 kcal (n = 47 females) at 8 years post-RYGB, respectively. Both studies reported a higher percentage of protein calories ranging from 19% to 23% compared with 17% reported in this study. The percentage of carbohydrate calories was similar between all 3 studies at 42% to 43%, whereas the mean percentage of total fat calories showed more variability from 33% to 39%.

Strategies both to encourage weight maintenance and to prevent weight regain in the WLS population include establishing a relationship with a medical provider who has experience in working with bariatric patients and who can assist in monitoring healthy eating and exercise behaviors.^{4,28-30} The 2008 Bariatric Surgery Guidelines²⁶ recommend annual follow-up visits after 2 years postsurgery for routine metabolic, nutrition, and medical monitoring. Medical providers should screen for medications that promote weight gain and emphasize the importance of self-monitoring techniques.

It is well known that self-monitoring is one of the most widely used behavioral strategies in weight loss and weight maintenance for creating awareness of current behaviors.^{12,31-34} Research has shown that deliberate attention to a specific behavior and recording the characteristics of that particular behavior can lead to an intentional behavior change through successful self-regulation.^{12,31-34} Paper diaries originally used for self-monitoring in the 1980s have evolved into personal digital assistant dietary and exercise software programs used today.^{31,32} Regardless of the methods used to record personal behavior characteristics and weight change (bathroom scale), truthfulness, consistency, and timeliness of

recording the monitored behavior or weight change are critical in determining the reliability of the data recorded.³¹ Finally, according to the weight loss research in nutrition monitoring, completeness of food records and frequency in self-monitoring eating behaviors are associated with individuals sustaining a higher weight loss than individuals who do not record food intake behaviors.³⁵⁻⁴⁰

Some of the limitations of the pilot study include a small sample of homogeneous females living in rural western South Dakota. Selection bias excluded rural individuals who did not have computer skills and/or access to the Internet. Some individuals were excluded from the study because of distance, which prevented them from traveling to the in-person interview and study orientation. The demographic information and food intake records were self-reported. The food records may reflect an underestimation of actual caloric intake, change in eating behaviors/food choices, and portion size, which should be taken into consideration.

CONCLUSION

Conclusions from this pilot study support the need for continual nutrition monitoring of eating behaviors associated with weight maintenance and/or weight regain in patients after gastric bypass surgery. Clearly, some less healthy food and beverage choices and eating behaviors were reported in the food logs in this sample of patients postsurgery. The primary message for medical providers from this feasibility study is the importance of food and beverage intake assessment and nutrition education on long-term behavior change in patients who had gastric bypass surgery. Finally, more research is needed to support healthy eating and exercise behaviors in patients who have undergone gastric bypass surgery, in addition to exploring other environmental factors potentially influencing weight maintenance and weight regain in the post-WLS population.

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