



Fasting Experiences of the Patients after Sleeve Gastrectomy: An Observational Cohort Study

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Abstract

Background: Demands for fasting occasionally arise in patients undergoing bariatric surgery, depending on their beliefs.

Objectives: In the present study, patients who had undergone laparoscopic sleeve gastrectomy (LSG) and experienced fasting at different postoperative times were examined, and the effects of fasting in Ramadan were evaluated.

Methods: A total of 206 patients who underwent LSG were included in the study. All participants were asked to complete three separate questionnaires. The first questionnaire consisted of 15 items on general eating habits and fasting. The second questionnaire comprised 7 items, scores on a 10-point scale, assessing the feeling of hunger while fasting and the desire to get food. The third questionnaire included a total of 9 items asked to determine the psychological state.

Results: The first fasting was observed 13.6±9.1 months (1-36) after the operation. The mean hunger/food cravings score was 26.1±9.6, and the mean psychological disturbance index score was 6.9±3.8. A total of 42.6% of the patients stated that they lost weight while fasting. There was no significant difference between the genders in terms of food consumption habits. There was no difference between the groups in terms of weight and energy level changes after the initiation of fasting.

Conclusion: One year after LSG, most people begin fasting, and women begin their fasting earlier than men. Fasting becomes more difficult after surgery as time passes.

Keywords: Bariatric surgery, Fasting, Laparoscopic sleeve gastrectomy

1. Background

The association of obesity, which is the paramount public health problem of our time, with such diseases as type 2 diabetes mellitus, hypertension, ischemic heart disease, obstructive sleep apnea, osteoarthritis, and various cancers has been referred to in the literature (1). Bariatric surgical procedures reduce hunger and increase satiety through exerting hormonal effects; nonetheless, they may cause nutritional deficiencies and micronutrient malabsorption (2). Restrictive bariatric surgeries reduce the stomach capacity and calorie intake. It is possible to achieve and maintain weight loss by providing changes in eating habits in patients undergoing these surgeries. Laparoscopic sleeve gastrectomy (LSG) is the most commonly used restrictive surgery that relies primarily on the reduction of gastric volume (3,4).

Fasting is an act of worship as ancient as human history and found in various forms in almost all societies and religions, such as Judaism, Christianity, and Islam, as well as in primitive tribes and human religions. The Jews accepted fasting as lowering and disciplining the self and stated that an individual would not do anything during fasting, and they also fast in memory of mourning and historical disasters. Christians also practiced fasting as a diet and increased the number of fasting days in a year.

Islam, on the other hand, has made fasting more functional with binding provisions and has given it a disciplined form of worship. People believe that fasting brings substantial benefits to the soul and the body (5).

Ramadan is the ninth month in the Islamic calendar, and Muslims are required to fast (refrain from any amount of food and drink) throughout this month (each day from sunrise to sunset) (6). Demands for fasting occasionally arise in patients who undergo bariatric surgery, depending on their beliefs. There is a dearth of information regarding when and how these patients can fast.

2. Objectives

In the present study, patients who had undergone laparoscopic sleeve gastrectomy and experienced fasting at different postoperative times were examined, and the effects of fasting in Ramadan were evaluated.

3. Methods

This study was confirmed by Institutional Review Board (2021-17357) and was planned prospectively. Signed consent forms were obtained from all participants. The patients' information was collected between February 2021 and March 2021.

3.1. Patients

A total of 206 patients aged 15-60 years who underwent LSG between June 2017 and June 2020 were included in the study. Patients who underwent different types of bariatric surgery or developed additional complications and those who refused to be surveyed were excluded from the study.

3.2. Surgical method

A laparoscopic sleeve gastrectomy was performed in all patients. All surgical interventions were performed by two experienced surgeons using the same technique (HE, AS). In operation, approximately 80% of the stomach was removed so that the capacity of the remaining stomach was approximately 100 ml. None of the cases required conversion to open surgery. All operations were performed according to the same procedure.

3.3. Questionnaires

All participants were asked to complete three separate questionnaires. The first questionnaire consisted of 15 items on general eating habits and fasting. The second questionnaire comprised of 7 items rated on a 10-point scale, including the feeling of hunger while fasting and the desire to get food. The higher scores were suggestive of more difficulty while fasting. The total possible score was 70, and the total score obtained was expressed as the "Hunger/Food Cravings Index" score. The authors of this article described these two questionnaires since there were not available in the literature. All the answers in these two questionnaires were analyzed separately instead of interpreting the total score.

The third questionnaire included a total of 9 questions asked to determine the psychological state (Patient Health Questionnaire-9, PHQ-9). Responses were scored on a 4-point Likert scale, ranging from 0-3 (0: Never, 1: Some days, 2: Mostly, and 3: Almost always). Higher scores indicate a higher level of psychological problems. The total possible score was 27, and the total score obtained was expressed as the "Psychological Disorder Index" score. A PHQ-9 total score of 0-4 signifies "normal" or minimal depression. The scores 5-9, 10-14, 15-19, and ≥ 20 are indicative of mild, moderate, moderately severe, and severe depression, respectively. The reliability and validity of the PHQ-9 have been evaluated in several studies (7,8).

3.4. Statistical analysis

All statistical analyzes in the study were conducted using SPSS software (version 25.0). Descriptive data were presented as numbers and percentages. In terms of categorical variables, comparisons between groups were made with Pearson's Chi Square test and Fisher's Exact Test. The suitability of continuous variables for normal

distribution was confirmed by the Kolmogorov-Smirnov Test. The differences between the groups in terms of continuous variables were analyzed using Student's t-test, and the comparison of mean values between multiple groups was made by variance analysis. The relationship between continuous variables was tested using Spearman's correlation analysis. The results were evaluated within the 95% confidence interval, and p-values less than 0.05 were considered statistically significant. Bonferroni correction was made where appropriate.

4. Results

Regarding gender, the majority (70.9%) of participants were female. A total of 96.1% of the patients participating in the study were fasting, 89.8% of the patients stated that they had sahur (the meal eaten before sunrise in the morning), and 64.1% indicated that they had dyspeptic symptoms such as gastric burning, meteorism, and reflux, while fasting. Moreover, 63.1% of the patients in the study underwent an operation more than two years ago. The mean age of the patients was 37 ± 9 years (age range: 15-60 years). The mean first fasting was 13.6 ± 9.1 months (ranging between 0.1-36 months) after the operation. (Table 1). The mean time from the operation to the first fasting was found to be significantly higher in men (16.1 ± 10.5 months) than that in women (12.5 ± 8.3 months) ($P=0.015$) (Table 2).

Table 1. Distribution of demographic variables and questionnaire scores

	n (%)
Gender	
Men	60 (29.1)
Women	146 (70.9)
Marital status	
The married	142 (68.9)
Single	58 (28.2)
Other	6 (2.9)
Post-operation time	
0-3 months	6 (2.9)
3-6 months	20 (9.7)
6-12 months	23 (11.2)
1-2 years	27 (13.1)
More than two years	130 (63.1)
Smoking	68 (33.0)
Fasting	198 (96.1)
Eating at sahur	185 (89.8)
Having dyspeptic symptoms while fasting	132 (64.1)
	Mean\pmSD (Min-Max)
Age (years)	37.0 \pm 9.0 (15-60)
First fasting in which month after the operation	13.6 \pm 9.1 (0.1-36)
Hunger/Food Cravings Index Score *	26.1 \pm 9.6 (5-59)
Psychological Disease Index Score **	6.9 \pm 3.8 (0-22)

*7 questions are evaluated over 70 points in total. High score=having difficulty. Nine questions are evaluated on a total of 27 points. High score=more psychological problems. SD: Standard deviation.

Table 2. Comparison of some mean values between genders

	Men	Women	P-value
	Mean±SD	Mean±SD	
Age (years)	37.4±8.2	36.8±9.4	0.680
First fasting in which month after the operation	16.1±10.5	12.5±8.3	0.015
Hunger/Food Cravings Index Score *	26.8±9.8	25.9±9.5	0.509
Psychological Disease Index Score **	6.9±4.1	6.9±3.7	0.990

*7 questions are evaluated over 70 points in total. High score=having difficulty. Nine questions are evaluated on a total of 27 points. High score=more psychological problems. SD: Standard deviation

There was no significant difference between the genders in terms of food consumption habits, as well as weight and energy level changes, after fasting (P>0.05 for each) (Table 3). There was no significant difference between the patients who underwent the operation more than two years ago and those who did so within two years in terms of the mean scores of the first fasting time, Hunger/Food Cravings Index, and Psychological Disturbance Index scores (P>0.05 for each) (Table 4). The rate of those who stated that fasting became

easier after the operation in the patients who underwent the operation more than two years ago than those who did so within two years. In addition, the rate of those who stated that the level of difficulty did not change after the operation was significantly higher in the patients who underwent the operation more than two years ago than those who did so within two years (P=0.031). There was no significant difference between the groups in terms of weight and energy level changes after fasting (P>0.05 for each) (Table 5).

Table 3. Comparison of distribution rates of answers given to some survey questions between genders

n	Men (n=60)	Women (n=146)	Total (n=206)	P-value*
	n (%)	n (%)	n (%)	
Snack between iftar and sahur	45 (75.0)	113 (77.4)	158 (76.5)	0.627
Do you obey the solid-liquid distinction in iftar?	39 (65.0)	103 (70.5)	142 (68.9)	0.613
Are you paying attention to your protein intake?	34 (56.7)	90 (61.6)	124 (60.2)	0.522
Carbohydrate consumption				
Increased	13 (21.7)	36 (24.6)	49 (23.8)	0.265
Decreased	26 (43.3)	73 (50.0)	99 (48.1)	
Did not change	21 (35.0)	37 (25.4)	58 (28.1)	
Dessert consumption				
Increased	21 (35.0)	53 (36.3)	74 (35.9)	0.607
Decreased	23 (38.3)	44 (30.1)	67 (32.5)	
Did not change	16 (26.7)	49 (33.6)	65 (32.6)	
Do you force yourself to eat more after feeling full?	4 (6.7)	15 (10.3)	19 (9.2)	0.578
Can you meet the amount of water you need daily between iftar and sahur?	18 (30.0)	44 (30.1)	62 (30.1)	0.812
Does the idea of staying hungry for a long time distract you from a healthy diet?	15 (25.0)	49 (33.6)	64 (31.1)	0.378
Have you observed any changes in your weight since you started fasting?				
At the same weight	30 (60.0)	64 (43.8)	94 (45.6)	0.314
Gained weight	10 (20.0)	15 (10.3)	25 (12.1)	
Lost weight	20 (40.0)	67 (45.9)	87 (42.3)	
Do you think there is a change in your energy level from pre-surgery to fasting now?				
Increased	16 (26.7)	38 (26.0)	54 (26.2)	0.562
Decreased	18 (30.0)	59 (40.4)	77 (37.4)	
Did not change	26 (43.3)	49 (33.6)	75 (36.4)	
When was it easier to fast?				
Before the operation	9 (15.0)	27 (18.5)	36 (17.5)	0.942
After the operation	31 (51.7)	70 (48.0)	101 (49.0)	
Did not change	20 (33.3)	49 (33.5)	69 (33.5)	

Table 4. Comparison of some mean values between groups according to post-operation time

	Post-op ≤2 years	Post-op >2 years	p
	Mean ± SD	Mean ± SD	
Age (years)	35.3 ±10.1	37.9±8.3	0.049
First fasting in which month after the operation	13.7±9.3	13.5±9.0	0.842
Hunger/Food Cravings Index Score *	26.3±8.7	26.1±10.0	0.881
Psychological Disease Index Score **	6.9±3.8	6.9±3.8	0.925

*7 questions are evaluated over 70 points in total. High score=having difficulty. Nine questions are evaluated on a total of 27 points. High score=more psychological problems. SD: Standard deviation.

Table 5. Comparison of the distribution rates of the answers given to some questionnaires among the groups that were post-operation time

	Post-op ≤2 years n=76 (%)	Post-op >2 years n =130 (%)	Total n=206 (%)	P-value*
Snack between iftar and sahur	58 (76.3)	100 (76.9)	158 (76.7)	0.554
Do you obey the solid-liquid distinction in iftar?	57 (75.0)	85 (65.4)	142 (68.9)	0.251
Are you paying attention to your protein intake?	57 (75.0)	67 (51.5)	124 (60.2)	0.002
Carbohydrate consumption				
Increased	18 (24.0)	31 (23.8)	49 (23.8)	0.930
Decreased	35 (46.7)	64 (49.2)	99 (48.5)	
Did not change	23 (29.3)	35 (27.0)	58 (27.7)	
Dessert consumption				
Increased	28 (36.8)	46 (35.4)	74 (35.9)	0.818
Decreased	23 (30.3)	44 (33.8)	67 (32.5)	
Did not change	25 (32.9)	40 (30.8)	65 (31.6)	
Do you force yourself to eat more after feeling full?	5 (6.6)	15 (11.5)	19 (9.2)	0.443
Can you meet the amount of water you need daily between iftar and sahur?	27 (35.5)	35 (26.9)	62 (30.1)	0.335
Does the idea of staying hungry for a long time distract you from a healthy diet?	23 (30.3)	41 (31.5)	64 (31.1)	0.727
Have you observed any changes in your weight since you started fasting?				
At the same weight	37 (48.7)	57 (43.8)	93 (45.1)	0.487
Gained weight	11 (14.5)	13 (10.0)	24 (11.7)	
Lost weight	28 (36.8)	60 (46.2)	87 (42.2)	
Do you think there is a change in your energy level from pre-surgery to fasting now?				
Increased	22 (28.4)	33 (25.4)	55 (26.7)	0.693
Decreased	29 (37.8)	48 (36.9)	77 (37.3)	
Did not change	25 (33.8)	49 (37.7)	74 (36.0)	
When was it easier to fast?				
Before the operation	14 (18.9)	22 (16.9)	36 (17.5)	0.031
After the operation	45 (59.5)	56 (43.1)	101 (49.0)	
Did not change	17 (21.6)	52 (40.0)	69 (33.5)	

5. Discussion

The present study aimed to analyze patients' tendencies to fast after LSG. It was detected that the average start of fasting time was 13,6 months after surgery, and female patients were likely to start fasting earlier than males. In addition, fasting was considered to be easier in the first two years after surgery; nonetheless, it became more difficult in the following years. The nutritional habits and psychological parameters evaluated in this study did not differ based on gender or postoperative time. Restrictive bariatric surgery practices act on the basis of the reduction of stomach volume and calorie intake; therefore, making changes in dietary habits with these practices is critical to the success and maintenance of weight loss.

Yehoshua et al. (9) reported that LSG causes a decrease in volume and an increase in stomach pressure. The volume of 1.553 cm³ in a healthy stomach decreases to an average of 129 cm³ after LSG. Stomach pressure, on the other hand, increases to 43 mmHg after LSG, while it is 34 mmHg in a full stomach (9). Consequently, the diet of LSG patients who can take a small amount of food at a time is crucial in terms of content and time. Permanent changes in lifestyle are likely to result in failure to lose weight, regain weight, or complications (10). In such a process, it is very important to determine when to fast for patients who want to fast as an act of

worship.

There are 1.6 billion Muslims living in numerous different countries and environments across the globe. Accordingly, the month of Ramadan and fasting affect a large part of the global population. The social, religious, and mental activities and effects of Ramadan may differ from country to country (11). Fasting in the ninth month of the lunar calendar (Ramadan) is a religious obligation for all adult Muslims. Fasting is fulfilled from sunrise to sunset in the form of a complete restriction of food or fluid intake. The duration of this restriction varies between 10 and 19 hours, depending on the season of the solar calendar when Ramadan coincides with that year (Ramadan starts approximately 10 days earlier each year in the solar calendar) (12). Typically, Muslims consume a pre-dawn meal called "sahur". After fasting, they consume a second big meal, called as "iftar", after sunset. In addition, some Muslims change their medication regimens to strictly adhere to fasting principles. Long-term fasting has been shown to affect many issues, such as metabolic profiles, weight, kidney function, blood pressure, and diabetes mellitus control (13,14).

After sunset and during the night, Muslims can eat and drink as much as they need, compensating for the lack of fluid and calorie intake during abstinence. Accordingly, late eating and drinking will reduce the time required for night sleep. Therefore, body metabolism and daily sleep cycle are likely to be

affected by Ramadan (15). Bariatric surgical procedures typically reduce hunger and increase satiety while decreasing micronutrient absorption, potentially leading to nutrient deficiencies. Micronutrient deficiencies, including trace elements, essential minerals, water, and fat-soluble vitamins, are common in obese people and often persist or exacerbate after bariatric surgery, despite universal recommendations on multivitamin and mineral supplements (2).

Although fasting does not have a significant negative effect on healthy individuals (16,17), total hunger during long summer days (avoiding all kinds of nutrition, including fluids) may put patients at risk of dehydration after bariatric surgery (18). Long-time fasting can lead to a desire to eat faster in larger quantities, leading to vomiting, increased dehydration, and malnutrition. The foods usually eaten at sunset meals, such as sweets and fried pastries, may also result in dumping syndrome or steatorrhea in some patients. Small stomach volume may cause inadequate food intake at main meals of iftar and sahur, as well as a disruption in routine medication used. In the present study, about 69.8% of the patients gave a negative answer to the question, "are you able to meet the daily amount of water you need between iftar and sahur?".

While bariatric surgery typically reduces food calorie consumption, it also significantly reduces daily protein intake compared to the preoperative period due to its effect on more difficult digestion and satiety induction (19-21). Inadequate protein intake has been shown to reduce lean body mass, metabolic rate, and weight loss in people who have undergone bariatric surgery (19,21). The optimal protein intake in postbariatric surgery patients is controversial and clearly varies according to the person's height, weight, and the type of bariatric surgery. Current guidelines recommend a minimum protein intake of 60 g per day (23). In the present study, approximately 60% of fasting patients stated that they paid attention to protein intake; moreover, no statistical difference was observed between genders in terms of protein intake during fasting times.

Al-Ozairi et al. (25) prospectively examined patients undergoing LSG who were fasting during Ramadan. They found that total calorie and protein intake during fasting decreased significantly in both men and women compared to non-fasting days. They added that when fasting, men and women consumed 20.4% ($P=0.018$) and 16.9% ($P<0.001$) fewer calories, respectively. Nonetheless, they observed no significant difference in fluid intake. According to the Modified Delphi Consensus among qualified bariatric surgeons, the patients who require fasting following LSG should drink 1.5-2 liters of fluid per day and take an average of 60 g of protein and multivitamins per day (24). In the present study, when fasting, it was found that carbohydrate consumption decreased in

48.5% of the patients, and there was no difference between genders in terms of carbohydrate consumption. It has been reported in the literature that fasting does not cause low mood (depression) in patients with a cancer-related stoma and those who have LSG (24). In the present study, we obtained the same result with the PHQ-9 questionnaire.

Bariatric surgery causes an increase in satiety and a decrease in hunger through several integrated mechanisms (25). Both men and women in the present study reported that they felt less hungry during Ramadan compared to non-fasting days after Ramadan. In addition, 90.7% of the patients answered negatively to the question, "do you force yourself to eat more after feeling full?". A total of 42.6% of the patients stated that they lost weight while fasting. The preference for appetizing foods in both genders during Ramadan suggests that hedonic and cultural factors may markedly affect eating behaviors. However, the socio-cultural effects of functional, neurohormonal, and fasting on appetite and satiety deserve further study (25).

There is no consensus on how long after the operation patients should start fasting. We divided the patients into two groups according to the time elapsed after the operation. There was no difference between the patients who underwent the operation within two years and those who did so more than two years ago in terms of the mean scores of the first fasting time, Hunger/Food Cravings Index, and Psychological Disturbance Index scores. The rates of fasting and having sahur were similar among the groups. The first successful fasting occurred 13.6 ± 9.1 months (ranging between 0.1-36 months) after the operation. In agreement with the current study, Kermansaravi et al. reported an expert consensus on delaying fasting for 6-12 months after bariatric surgery in Modified Delphi Consensus (24). The rate of those who stated that fasting became easier and did not change after surgery was higher in patients who had surgery more than two years ago. There was no difference between the groups in terms of weight and energy level changes after the initiation of fasting.

Among the notable limitations of this study, we can refer to the use of unvalidated questionnaires (questionnaires 1 and 2), which inquire about general eating habits and fasting. Since Ramadan, which is the month of fasting for Muslims in the first place, coincides with different dates each year according to the solar calendar, a full assessment requires a perspective of almost 36 years. Furthermore, the present study is one of only reflects the results in Turkey. Worldwide, more than one billion Muslims fast at different times and conditions.

6. Conclusion

Fasting usually begins one year after LSG, and women start fasting earlier than men. Fasting

becomes more difficult as time passes after surgery. Although we tried to investigate the concept of 'LSG and fasting' using a questionnaire-based study, future randomized prospective studies on this subject will provide more accurate data for literature.

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Footnotes

Conflicts of Interest: The authors declare that they have no conflict of interest.

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