


ORIGINAL  
ARTICLEQuality of Life and Associated Factors among Individuals  
Undergoing Sleeve Gastrectomy in Rasht, IranRamin Ebrahimian Jektaji<sup>1</sup>, Mahta Moghaddam Ahmadi<sup>2</sup>, Khashayar Khosravi<sup>2</sup>, Moein MoghaddamAhmadi<sup>1,2</sup> <sup>1</sup> Department of Surgery, School of Medicine, Poursina Hospital, Guilan University of Medical Sciences, Rasht, Iran<sup>2</sup> Clinical Research Development Unit of Poursina Hospital, Guilan University of Medical Sciences, Rasht, Iran

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**Abstract****Introduction:** Sleeve gastrectomy represents a vital surgical intervention for individuals suffering from obesity, yielding substantial reductions in body weight and fostering beneficial effects on conditions associated with obesity. This study investigated patients' quality of life (QoL) and associated factors six months after sleeve gastrectomy in Rasht, Iran.**Methods:** The cross-sectional study was conducted on 66 sleeve surgery patients. Patients were selected through a convincing sampling method. Demographic and clinical data of all participants were recorded, and the World Health Organization Quality of Life Questionnaire was utilized to assess their QoL. Data were analyzed in SPSS 16 using the Mann-Whitney U, Kruskal-Wallis, T-test, and Friedman tests, and the significant level was set at 0.05.**Results:** The patients' body mass index (BMI) six months after sleeve gastrectomy surgery was significantly lower than their BMI before surgery ( $33.31 \pm 5.85$  vs.  $43.41 \pm 5.93$ , 95% confidence interval,  $P=0.001$ ). The frequency of sleeve leak and bleeding was equal among patients (1.5%), and no pulmonary embolism or mortality cases were reported. The mean general QoL score among patients was  $79.16 \pm 14.58$ . The mean score of the physical health domain of QoL was higher among men with obstructive sleep apnea and in patients without gastric leaks ( $P<0.05$ ). The mean score of the psychological health domain of QoL was higher among patients with dyslipidemia ( $P<0.05$ ). The mean scores of mental health and social relation domains of QoL, as well as that of general QoL, were higher in patients with sleeve leaks and bleeding after the surgery ( $P<0.05$ ).**Conclusion:** The findings suggested that sleeve gastrectomy contributes to improvements in various domains of QoL, particularly among men, patients with dyslipidemia and obstructive sleep apnea, and those who experienced gastric sleeve leaks and bleeding during and after the surgery.**Key words:** Bariatric surgery, Gastrectomy, Obesity, Quality of life**Introduction**

Bariatric surgery has been introduced as the most effective method for the treatment of obesity (1). Obesity is a global pandemic and a significant public health concern due to its high prevalence and negative impact on mortality, illness rates,

healthcare expenditure, and quality of life (QoL) (2). Untreated obesity results in different health-related complications, including cardiovascular diseases, diabetes, dyslipidemia, hypertension, sleep apnea, musculoskeletal disorders, depression, and malignancies (3,4). To address this problem, surgical interventions can lead to sustained weight

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loss over the long term, leading to enhancements in the QoL of the patients (4,5). The commonly performed bariatric interventions include laparoscopic sleeve gastrectomy (LSG), Roux-en-Y gastric bypass (LRYGB), and laparoscopic adjustable gastric banding (LAGB) (6). LSG involves removing a large portion of the stomach to reduce intake and induce hormonal changes (7). Meanwhile, LRYGB creates a small stomach pouch and reroutes the intestine, combining restriction and malabsorption for significant weight loss and hormonal shifts (8). On the other hand, LAGB uses an adjustable band to limit intake, offering reversibility but less weight loss and higher long-term complication rates (9). LSG and LRYGB provide greater, more sustained weight loss but with higher risks of complications and nutritional deficiencies, making the choice dependent on individual patient factors (10).

QoL refers to how an individual perceives their general life circumstances, which include cultural elements, values, objectives, prospects, worries, and the surrounding situation (11). Higher grades of obesity are associated with lower QoL and reduced survival, leading to a substantial financial burden (3). However, there is limited published data on the demographic and clinical factors that may influence the QoL after bariatric surgery (12,13). Given the multidimensional and complex nature of QoL (14,15), our study aims to investigate the QoL of patients and related factors six months after sleeve gastrectomy. Quality of life, which plays a crucial role in motivating individuals to consider bariatric surgery (4,16), pertains to an individual's subjective evaluation of their overall life circumstances. This evaluation encompasses various aspects, such as cultural factors, personal values, goals, expectations, standards, concerns, and the influence of the surrounding environment (11). In the current study, we investigated the QoL of patients and associated factors six months after sleeve gastrectomy in Rasht, Iran.

## Methods

This cross-sectional study was conducted on 66 patients referred to public and private medical centers in Guilan province, Iran, for gastric sleeve surgery between 2019 and 2021. The present investigation has been confirmed by the Ethical Committee of Guilan University of Medical Sciences, Rasht, Iran (IR.GUMS.REC.1400.598). All patients gave their written informed consent to participate in the study. Individuals aged 16 to 60 of both genders were selected through a convincing sampling method. Exclusion criteria consisted of

depression, neurological disorders, reflux disease, large hiatal hernia, active peptic ulcer disease, heart disease, and alcohol and opium use. Demographic characteristics and clinical data were collected through a questionnaire, including age, gender, marital status, level of education, body mass index (BMI) before and after sleeve gastrectomy, diabetes, hypertension, dyslipidemia, and obstructive sleep apnea. Additionally, complications, such as gastric sleeve leak, bleeding, and pulmonary embolism during and after surgery, were recorded based on the patient's medical records.

The QoL was evaluated using the abbreviated version of the World Health Organization's Quality of Life Questionnaire (WHOQOL-BREF). This instrument was validated for the Iranian population, and Cronbach's alpha was above 0.70 for all domains (17). The WHOQOL-BREF comprises 26 items organized into four distinct domains, namely physical health, psychological health, social relations, and environmental health. The physical health domain includes seven items related to daily activities, mobility, functional capability, energy levels, pain perception, and sleep quality. The psychological health domain encompasses six items covering self-image, the presence of negative opinions, the cultivation of positive attitudes, self-esteem, mental outlook, learning ability, memory and concentration, religious beliefs, and overall mental status. The domain of social relations encompasses three distinct elements to evaluate personal relations, social support, and sexual well-being. Finally, the domain of environmental health encompasses a comprehensive set of eight items that examine various aspects, namely financial resources, safety, accessibility to health and social services, physical living environment, opportunities for skill development and knowledge acquisition, recreational facilities, general environmental factors (e.g., noise and air pollution), and transportation (18).

In addition to the specific domains, the WHOQOL-BREF instrument includes two general questions that capture overall QoL and satisfaction with health. These questions inquire about an individual's perception of their QoL and satisfaction with their current health status (11,19). In the present investigation, the QoL analysis was performed using the general QoL indicators, including the perception of QoL and satisfaction with health status, as well as the four specific domains of the WHOQOL-BREF questionnaire. This analysis was carried out over six months. According to the methodology, domain scores were transformed to a 0- to 100-point scale using the WHOQOL transformation table (20).

A uniform scale adjustment was implemented to standardize the scores across all domains, yielding a range of 4 to 20 for each domain. Higher scores correspond to a more favorable QoL assessment in this adjusted scale.

The normality of the variable distribution was assessed using the Shapiro-Wilk test. Quantitative variables were expressed as the mean  $\pm$  standard deviation (SD), while categorical variables were reported as percentages. The correlation and association between variables were evaluated using Mann-Whitney U, Kruskal-Wallis, T-test, and Friedman tests. A significance level of 0.05 or less was adopted to determine statistical significance. All statistical analyses were performed using SPSS version 23.

## Results

The mean age of individuals was  $36.12 \pm 9.08$  years, and 81.8% (n=54) of the participants were women. The BMI of the patients in the six months after sleeve gastrectomy surgery was lower than their BMI before the surgery ( $33.31 \pm 5.85$  vs.  $43.41 \pm 5.93$ ,  $P=0.001$ ). Dyslipidemia (37.9%) was the most frequent disorder among patients.

The frequency of gastric sleeve leak and bleeding was equal among patients (1.5%), and pulmonary embolism and mortality were not reported in any of the patients (Table 1). The mean general QoL score among patients was  $79.16 \pm 14.58$ . Among the domains of QoL, the highest and lowest mean scores were obtained for physical health and environmental health at  $84.22 \pm 14.20$  and  $69.66 \pm 9.50$ , respectively (Table 2).

**Table 1: Demographic and clinical characteristics of patients**

Variables	Amounts*
<b>Age</b>	36.12 $\pm$ 9.08
<b>Gender</b>	Female 54 (81.8)
	Male 12 (18.2)
<b>Marital status**</b>	Single 21 (31.8)
	Married 41 (62.12)
<b>Level of education</b>	Under diploma 11 (16.7)
	Diploma 23 (34.8)
	Bachelor's degree 25 (37.9)
	Master and PhD 7 (10.6)
<b>BMI before surgery</b>	43.41 $\pm$ 5.93
<b>BMI six months after surgery</b>	33.31 $\pm$ 5.85
<b>Diabetes</b>	
No	0 (0)
Yes	10 (15.2)
<b>Hypertension</b>	
No	0 (0)
Yes	11 (16.7)
<b>Dyslipidemia</b>	
No	0 (0)
Yes	25 (37.9)
<b>Obstructive sleep apnea</b>	
No	0 (0)
Yes	10 (15.2)
<b>Gastric sleeve leak</b>	
No	0 (0)
Yes	1 (1.5)
<b>Bleeding</b>	
No	0 (0)
Yes	1 (1.5)
<b>Pulmonary embolism</b>	
No	0 (0)
Yes	0 (0)
<b>Mortality</b>	
No	0 (0)
Yes	0 (0)

BMI: Body mass index; \* Values are reported as mean  $\pm$  standard deviation (Mean $\pm$ SD) or frequency n (%).

**Table 2: Quality of life of patients measured according to its subscales**

Domains	Mean±SD	95% CI
Physical health	84.22±14.20	(78.22-90.22)
Psychological health	72.22±10.03	(67.98-76.45)
Social relations	70.13±17.87	(62.59-77.68)
Environmental health	69.66±9.50	(65.64-73.67)
General QoL	79.16±14.58	(73.00-85.32)

SD: Standard deviation; 95% CI: Confidence interval; QoL: Quality of life.

Based on the Friedman test, the mean scores of QoL domains differed from one another, with physical health scoring at 3.66, psychological health at 2.14, social relations at 2.36, and environmental health at 1.84 ( $P=0.001$ ).

Among the participants, the mean QoL score for the physical health domain was higher in men than in women ( $91.07\pm 5.79$  vs.  $80.95\pm 16.84$ ,  $P=0.038$ ). The mean QoL score in the psychological health domain was higher among patients with dyslipidemia than among those without dyslipidemia ( $75.83\pm 8.24$  vs.  $70.42\pm 10.65$ ,  $P=0.028$ ). The mean QoL score for the physical

health domain was higher in patients with obstructive sleep apnea than in those without ( $94.04\pm 4.32$  vs.  $82.99\pm 14.76$ ,  $P=0.016$ ). Individuals without a gastric sleeve leak had a higher mean score in the physical health domain, while the other domains, excluding environmental health, exhibited higher mean scores in patients who experienced a gastric sleeve leak ( $P<0.05$ ). Moreover, the mean scores of psychological health, social relation domains, and general QoL, except for the domain of physical health ( $P=0.923$ ) and environmental health ( $P=0.095$ ), were higher among patients with bleeding ( $P<0.05$ ) (Table 3).

**Table 3: Quality of life in patients after sleeve gastrectomy based on demographic and clinical variables**

Variables	Domains									
	Physical health		Psychological health		Social Relations		Environmental health		General QoL	
	Values	P	Values	P	Values	P	Values	P	Values	P
<b>Age</b>	-1.22	0.544	-0.008	0.946	0.040	0.75 2	-0.055	0.661	-0.076	0.553
	<b>Gender</b>									
Male	91.07± 5.79	a	71.87± 8.90	b	78.78± 15.52	a	72.39± 6.36	b	77.27± 9.38	b
Female	80.95± 16.84	0.038	72.60± 10.41	0.822	67.29± 16.57	0.06 7	69.84± 7.26	0.266	81.97± 14.52	0.190
<b>Marital status</b>										
Single	82.93± 17.56	0.646	71.42± 9.34	0.307	67.54± 15.93	0.50 7	69.49± 6.98	0.657	80.00± 12.43	0.895
Married	86.12± 16.70		72.10± 61.69		69.17± 4.29		70.70± 53.40		80.14± 31.12	
<b>Level of education</b>										
Under diploma	87.50± 11.10	0.506	75.75± 7.64	0.676	75.00± 11.18	0.26 8	69.88± 6.13	0.154	78.40± 19.43	0.335
Diploma	85.26± 16.58		71.73± 10.50		70.45± 16.20		68.61± 7.62		80.95± 12.88	
Bachelor's degree	82.14± 16.14		71.16± 10.81		63.88± 17.83		70.50± 6.25		80.20± 12.17	
Master's and PhD degree	90.71± 5.41		74.40± 10.04		75.00± 20.41		75.89± 8.40		89.28± 11.24	
<b>BMI</b>	-0.322	0.101	-0.011	0.931	-0.069	0.58 5	+0.100	0.422	-0.005	0.972
<b>Diabetes</b>										
No	85.06± 15.01	0.975	71.94± 10.28	0.291	68.20± 16.82	0.27 4	70.53± 7.27	0.650	79.95± 12.81	0.088
Yes	87.14± 8.22		75.41± 8.88		75.00± 16.66		69.06± 6.49		87.50± 17.67	
<b>Hypertension</b>										
No	85.38± 15.06	a	72.57± 9.77	b	68.71± 17.51	a	70.45± 7.21	b	81.00± 12.74	b
Yes	85.71± 7.98	0.548	71.96± 12.08	0.857	71.96± 13.57	0.78 4	69.60± 7.00	0.916	81.81± 18.84	0.862

Table 3 continue

Dyslipidemia										
No	83.92± 17.20		70.42± 10.65		66.66± 19.11	<sup>a</sup> 0.13	69.81± 7.76		80.44± 13.69	<sup>a</sup>
Yes	87.66± 7.02	0.960	75.83± 8.24	0.028	73.33± 11.78	7	71.12± 6.00	0.474	82.29± 14.23	0.729
Obstructive sleep apnea										
No	82.99± 14.76		71.50± 10.38		67.74± 17.66	<sup>a</sup> 0.06	69.75± 7.44		80.55± 14.87	<sup>b</sup>
Yes	94.04± 4.32	0.014	79.1±6 .22	0.064	77.50± 7.90	3	73.43± 3.96	0.134	84.72± 13.66	0.407
Gastric sleeve leak										
No	85.44± 13.90	0.016	72.37± 10.14	<0.001	69.17± 16.97	0.00 8	70.28± 7.18	0.079	80.84± 13.71	<0.001
Yes	78.57		79.17		75.00		71.88		100.00	
Bleeding										
No	85.43± 14.17	0.923	72.30± 10.08	<0.001	69.17± 16.97	0.00 8	70.28± 7.18	0.095	80.84± 13.71	<0.001
Yes	85.71		83.33		75.00		71.88		100.00	

BMI: Body mass index; Analysis method of each domain of QoL based on variables: Age according to Pearson correlation method; Gender according to <sup>a</sup> Mann-Whitney U test and <sup>b</sup> Independent-samples t-test; Marital status according to Mann-Whitney U test; Education level according to Kruskal-Wallis H test; BMI according to Pearson correlation method; Diabetes according to Mann-Whitney U test; Hypertension according to <sup>a</sup> Mann-Whitney U test and <sup>b</sup> Independent-samples t-test; Dyslipidemia according to <sup>a</sup> Mann-Whitney U test and <sup>b</sup> Independent-samples t-test; Obstructive sleep apnea according to <sup>a</sup> Mann-Whitney U test and <sup>b</sup> Independent-samples t-test; Gastric sleeve leak according to One-sample t-test; Bleeding according to One-sample t-test.

## Discussion

Recent studies investigated the effects of bariatric surgery on individuals' post-surgical QoL, focusing on biomedical factors, including weight loss and the amelioration of associated conditions. Nevertheless, given the growing global prevalence of these surgical procedures, it is crucial to conduct comprehensive assessments of patients' QoL and related factors (21). This study investigated the QoL scores assessed using the WHOQOL-BREF instrument in a population-based sample from Northern Iran. In the present study, males had higher mean QoL scores in physical health than females. This observation is consistent with previous research findings suggesting that males generally exhibit higher levels of overall QoL than females (22,23). Additionally, it is well-known that males have greater exercise capacity than females across all age groups, which may contribute to higher ratings for physical health-related QoL (24). However, no significant gender difference was observed in other domains of QoL. Similarly, a study by Soares et al. found no gender variation in the QoL after bariatric surgery (12).

Wu et al. reported that bariatric surgery demonstrated efficacy in promoting weight loss, achieving diabetes remission, and improving dyslipidemia in the five-year post-surgery period (25). Correspondingly, our study demonstrated that patients with dyslipidemia had higher average QoL

scores in the psychological health domain. Obesity poses a substantial risk for various comorbidities, including dyslipidemia, diabetes, heart disease, stroke, hypertension, atherosclerosis, and certain kinds of cancer (26). Additionally, it has been observed that obesity is associated with increased mortality and a reduction in lifespan of approximately ten years (27), and obese individuals are more likely to experience disordered eating behaviors, psychological distress, and diminished health-related QoL (28). The impact of the patient's perception of assuming control over their disease and life on postoperative psychological well-being is a phenomenon that can be expected and understood (29,30). Furthermore, we found that patients with apnea had higher average QoL scores in the physical health domain compared to those without apnea after gastric sleeve surgery. It is widely recognized that weight gain can precede the onset of obstructive sleep apnea symptoms (31), and sleeve gastrectomy has been shown to significantly reduce the apnea-hypopnea index and improve obstructive sleep apnea symptoms, resulting in a significant reduction in the use of continuous positive airway pressure in most patients (32).

According to a meta-analysis conducted by Greenburg, bariatric surgery has been found to significantly affect daytime sleepiness and the harshness of obstructive sleep apnea (33). In addition, a greater initial sleep latency has been linked to decreased enhancements in physical functioning,

while insufficient sleep quality has been connected to reduced efficacy in weight loss endeavors (34). Therefore, it can be concluded that by reducing obesity, increasing lung volume and function, and improving sleep apnea, individuals' mental and physical health are enhanced (35). The incidence of postoperative complications following sleeve surgery ranges between 0% and 6% (36). We observed a frequency distribution of 1.5% for gastric leakage and bleeding after gastric sleeve surgery, with no reported fatal cases among the 66 participants. This aligns with findings from other studies, which indicate that gastric leaks may occur in approximately 1% of cases (37,38). We found that individuals who experienced gastric leaks and bleeding had higher average scores in the domains of mental health, social relations, and general QoL.

These findings are consistent with previous research, suggesting that, despite the minor side effects of sleeve gastrectomy, body image improvements, patient satisfaction, and self-esteem contribute to enhanced QoL across various domains (21,37). Moreover, using the WHOQOL-BREF questionnaires in our study enhanced its credibility, as these instruments are widely acknowledged and validated for assessing QoL. In the present study, the controlled before-after design, assessing QoL at different time points after surgery, allows for a holistic understanding of the overall influence on patient QoL. Nevertheless, the study faced some limitations, including its cross-sectional nature, patients' recall biases in self-reporting data, small sample size, restrictions related to the study center, incomplete data of QoL of the patients at the beginning, lack of a healthy control group that made it difficult to ascertain whether the observed enhancements in QoL could be exclusively attributed to bariatric surgery. It would be advisable to conduct further research with a larger sample size across multiple health centers.

## Conclusions

The results indicated improvements in various domains of QoL for men and patients with dyslipidemia and obstructive sleep apnea. Our findings highlighted the significance of incorporating patient-derived QoL evaluation in the treatment strategy for assessing the effectiveness of surgical procedures beyond clinical assessment.

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## Conflict of Interest

The authors declare that they have no competing interests.

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