

# Patient awareness about the indications and complications of sleeve gastrectomy

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## ABSTRACT

**Objectives:** To assess patients' awareness of the indications and complications of sleeve gastrectomy in King Khalid University Hospital, Riyadh, Saudi Arabia. **Methods:** The cross-sectional study conducted from December 2017 to May 2018 in KKHU, Riyadh, Saudi Arabia included all patients aged 18 years and older. Data collection was conducted through self-administered questionnaires. Chi-square test was performed to determine the significant differences between variables. A *P* value of < 0.05 was considered statistically significant. **Result:** Of 480 participants, 247 (51.5%) of them were male. The educational level of most was bachelor's degree (253; 52.7%). Most of the participants (326; 67.9%) are not aware about BMI. However, 80 (16.7%) participants knew the true answer to obese BMI. Of the total participants, 283 (59.0%) did not know about sleeve gastrectomy indications; however, 311 (64.8%) of the participants had heard about the complications of sleeve gastrectomy. All these results are correlated with the educational level of the participants. **Conclusion:** Our study shows a lack of awareness of sleeve gastrectomy indications and complications among study population. We need to increase public awareness about sleeve gastrectomy indications and complication by proper scientific health education in the community.

**Keywords:** Awareness, obesity, Saudi Arabia, sleeve gastrectomy

## Introduction

Obesity is a major health problem that affects daily life activities and contributes to numerous diseases.<sup>[1-6]</sup> It is now recognized as the most prevalent metabolic disease affecting both adults and children, reaching epidemic proportions in developed and developing countries.<sup>[3,5]</sup> Obesity is a common health problem in family medicine practice and most of family physicians might face patients who request bariatric surgery without scientific evidence-based indications, and just by peer influence or mass

media advertisements. So it is important to know how our patients are aware about the indications and possible complications of sleeve gastrectomy before referring them to obesity surgical clinics. In Saudi Arabia, prevalence of obesity is one of the highest in the world, with over 35% of the population being obese.<sup>[4,7]</sup> The prevalence of obesity in the country has increased in both genders by an average of 0.64% per year from 2012–2016.<sup>[4]</sup> Worldwide, the prevalence of obesity has shown a marked increase over the past 40 years.<sup>[1]</sup> Obesity should be managed in a stepwise approach. Initially, all obese patients should be counselled for lifestyle modification and behavioral therapies.<sup>[5]</sup> Pharmacological agents may also be used as second-line adjuncts to lifestyle modification.<sup>[5]</sup> The third line of management is bariatric surgery, which is considered the most effective long-term treatment for individuals

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Received: 21-09-2019

Revised: 22-11-2019

Accepted: 04-12-2019

Published: 28-01-2020

### Access this article online

#### Quick Response Code:



**Website:**  
www.jfmipc.com

**DOI:**  
10.4103/jfmipc.jfmipc\_806\_19

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**How to cite this article:** Al Watban ZH, Al Sulaiman OA, Al Suhaibani MS, Al Nafisah IY, Al Ateiq IM, Al Samil YA, *et al.* Patient awareness about the indications and complications of sleeve gastrectomy. *J Family Med Prim Care* 2020;9:321-6.

with severe obesity or moderate obesity complicated by comorbid conditions unresponsive to nonsurgical approaches.<sup>[5]</sup> The highest percentage of bariatric procedures performed were registered in Arabian Gulf countries although Arabian Gulf countries has the lowest number of research publications about bariatric surgery in comparison to Western countries.<sup>[8]</sup> Although bariatric surgeries are the most common surgeries performed to manage obesity, there are specific guidelines that should be followed, which vary with the type of procedure performed.<sup>[9-13]</sup> The surgical indications to perform sleeve gastrectomy in Saudi Arabia include adults with a body mass index (BMI) of 40 kg/m<sup>2</sup> or greater, adults with a BMI of 35 kg/m<sup>2</sup> or greater with severe comorbidities, and adults with a BMI of 30 kg/m<sup>2</sup> or greater with poorly controlled type 2 diabetes and increased cardiovascular risk.<sup>[9,12,13]</sup> Although studies have indicated that there are many complications of sleeve gastrectomy (SG), the prevalence of postoperative complications range between 4.4 and 12.8%.<sup>[14-16]</sup> Postoperative complications described in the literature include anastomotic leaks, hemorrhage, strictures, abscesses, nutritional deficiencies, vein thromboses, surgical site infections, and other rare conditions. However, the only major complications among them are leaks and hemorrhage. Anastomotic leak is a serious complication which is difficult to manage and is most commonly diagnosed after discharge. Leakage can occur from any location in the staple line, and can cause fever, abscesses, septicemia, metabolic disturbance, and/or multiple organ failure.<sup>[17]</sup> The incidence of leaks after sleeve gastrectomy ranges from 1.3 to 2.8%.<sup>[14,18-22]</sup> Bleeding is another major complication. However, it is uncommon, and the incidence can be reduced by using buttressing materials on the stapler line. Bleeding has been reported in 1.8–5% of procedures.<sup>[14,18-23]</sup> Strictures, which are less common, have an incidence rate of 0.591.4%.<sup>[21-25]</sup> The objective of this study is to assess patients' awareness of indications and complications of sleeve gastrectomy in King Khalid University Hospital, Riyadh, Saudi Arabia.

### Methods

This is a cross-sectional study which included admitted patients and outpatients at King Khalid University Hospital (KKUH), a tertiary care center in Riyadh, Saudi Arabia. This study was conducted from December 2017 to May 2018. The study included all patients aged 18 years and older. Using the single proportion equation, the calculated sample size consisted of 480 participants. The sample was collected using a simple random technique, by identifying participants from the patient list in the hospital wards and appointment schedules at outpatient clinics. Data collection was conducted through self-administered questionnaires, which were developed by reviewing the literature. The questionnaire's face and content validity have been checked and critiqued by a bariatric surgeon. The questionnaire was piloted on 48 subjects before it was used in this study. The questionnaire contains five sections: 1-participant consent form, 2- demographics which includes age, gender, and educational level, 3-questions assessing the knowledge of sleeve gastrectomy such as knowledge about BMI, BMI ranges, and sleeve gastrectomy, 4-questions assessing the knowledge of sleeve

gastrectomy indications, and 5- questions assessing the knowledge of sleeve gastrectomy complications. PubMed was used to find and identify related articles. The ethical approval was obtained from the ethical committee of the university teaching hospital 26 November 2017. This study was conducted according to the principles of the Declaration of Helsinki (Ethical Principles for Medical Research Involving Human Subjects). Data were analyzed using SPSS (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.). For categorical variables, data were represented as numbers and percentages. For continuous variables, data were presented as mean and standard deviation. Chi-square test was performed to determine the significant differences between variables; the correlation between educational level and other variables was established using the Spearman correlation. A *P* value of <0.05 was considered statistically significant.

### Results

A total of 480 participants were selected based on the inclusion and exclusion criteria and were given the questionnaire. The mean age of the participants was 33.40 ± 10.75 with age ranging from 18 to 66 years. 142 (29.6%) of the participants fall under the age of 18–25, 153 (31.9%) participants fall under the age of 26–35, 116 (24.2%) participants fall under the age of 36–45, 49 (10.2%) participants fall under the age of 46–55, 19 (4%) participants fall under the age of 56–65, and 1 (0.2%) participant falls under the age of 66–70. Of the 480 participants, 247 (51.5%) were male and 233 (48.5%) were female. Of the 480 participants, 13 (2.7%) have completed elementary school, 26 (5.4%) intermediate school, 124 (25.8%) secondary school, 253 (52.7%) undergraduation, 47 (9.8%) postgraduation, and 17 (3.5%) PhD. All demographics are presented in Table 1.

Of the total, 463 (96.5%) participants have heard about sleeve gastrectomy while 326 (67.9%) have not heard about body

**Table 1: Demographic data of the participants**

Variable	Frequency (n)	Percentages (%)	
Age	18-25	142	29.6%
	26-35	153	31.9%
	36-45	116	24.2%
	46-55	49	10.2%
	56-65	19	4.0%
	66-75	1	0.2%
Gender	Male	247	51.5%
	Female	233	48.5%
Educational level	Elementary school	13	2.7%
	Intermediate school	26	5.4%
	Secondary school	124	25.8%
	Bachelor's degree	253	52.7%
	Master's degree	47	9.8%
	Doctor of Philosophy degree	17	3.5%

mass index (BMI). Of 480 participants, 326 (67.9%) did not know about obese BMI, 2 (0.4%) responded as less than 18.5, 24 (5%) responded as 18.5–24.9, 48 (10%) responded as 25-29.9 and 80 (16.7%) responded as >30. Although 283 (59%) of the participants have not heard about sleeve gastrectomy indications, 311 (64.8%) participants have heard about the complications of sleeve gastrectomy. All participant responses about the general knowledge of sleeve gastrectomy are presented in Table 2.

The responses of 480 participants to multiple response questions about the indications of sleeve gastrectomy are adult with BMI less than 18.5 in 63 (13.2%) of the participants, adult with BMI more than 40 kg/m<sup>2</sup> in 278 (58.0%) of the participants, adult with BMI of 18.5 in 28 (5.8%) of the participants, adult with BMI from 18.5-24.9 in 114 (23.8%) of the participants, adults with BMI >30 kg/m<sup>2</sup>, poorly controlled type 2 diabetes, increased cardiovascular risk in 209 (43.6%) of the participants, adults with more than 35 kg/m<sup>2</sup> and severe comorbidities in 206 (43.0%) of the participants and for cosmetics in 192 (40.1%) of the participants. All participants' responses about indications of sleeve gastrectomy are presented in Table 3.

The responses of 480 participants in multiple response question about the acute complications of sleeve gastrectomy are hemorrhage in 290 (60.4%) of the participants, other nutritional and mineral deficiencies in 232 (48.3%) of the participants, anemia in 207 (43.1%) of the participants, iron deficiency in 222 (46.3%) of the participants, abscess in 171 (35.6%) of the participants, leak of gastric content in 162 (33.8%) of the participants, weight regain in 68 (14.2%) of the participants, neuropathies in 98 (20.4%) of the participants, twist of stomach in 95 (19.8%) of the participants, and pulmonary embolism in 68 (14.2%) of the participants [Table 4]. On the other hand, the responses of 480 participants in multiple response question about chronic complication of sleeve gastrectomy are hemorrhage in 245 (51.0%) of the participants, other nutritional and mineral deficiencies in 185 (38.5%) of the participants, anemia in 185 (38.5%) of the participants, iron deficiency in 196 (40.8%) of the participants, abscess in 98 (20.4%) of the participants, leak of gastric content in 165 (34.4%) of the participants, weight regain in 115 (24.0%) of the participants, neuropathies in 122 (25.4%) of the participants, twist of stomach in 135 (28.1%) of the participants, and pulmonary embolism in 100 (20.8%) of the participants [Table 4]. All participant responses about acute and chronic complications of sleeve gastrectomy are presented in Table 4.

There was positive significance correlation between the educational level and both perception about BMI ( $-0.136, P = 0.003$ ) and knowledge about obese BMI ( $0.135, P = 0.003$ ). There was no significant correlation between the educational level and perception of both sleeve gastrectomy procedure and sleeve gastrectomy complication. In addition, there was no significance correlation between the educational level and perception of sleeve gastrectomy indications [Table 5].

**Table 2: General knowledge of participants about sleeve gastrectomy**

Characteristics	Response	Frequency (n)	Percentages (%)
Heard about Sleeve gastrectomy	Yes	463	96.5%
	No	17	3.5%
Heard about body mass index	Yes	154	32.1%
	No	326	67.9%
Knowledge of obese body mass index	I don't know	326	67.9%
	less than 18.5	2	0.4%
	18.5-24.9	24	5.0%
	25-29.9	48	10.0%
	>30	80	16.7%
Heard about sleeve gastrectomy indication	yes	197	41.0%
	no	283	59.0%
Heard about sleeve gastrectomy complications	yes	311	64.8%
	no	169	35.2%

**Table 3: Participants responses about sleeve gastrectomy indications**

Characteristics	Frequency (n)*	Percentages (%)†
Adult with BMI less 18.5	63	13.2%
Adult with BMI more than 40 kg/m <sup>2</sup>	278	58.0%
Adult with BMI of 18.5	28	5.8%
Adult with BMI from 18.5-24.9	114	23.8%
Adults with BMI >30 kg/m <sup>2</sup> , poorly controlled type 2 diabetes, increased cardiovascular risk.	209	43.6%
Adults with more than 35 kg/m <sup>2</sup> and severe comorbidities	206	43.0%
For cosmetics	192	40.1%

\*responses exceed 480. †percentages exceed 100%. Patient can choose more than one item

## Discussion

A proper awareness among public about the specific surgical managements such as sleeve gastrectomy is a fundamental step to ensure that the affected individuals will seek medical advice for weight reduction. Many factors such as educational level, patient–physician relationship, Internet, lifestyle modification after surgery, and individual experience may affect individuals' decision. Searching about healthcare information by Internet is the commonest method.<sup>[20]</sup> However, the average quality of websites that provide information about bariatric surgery was of 'poor' to 'fair' quality.<sup>[20]</sup>

In this study, we aimed to assess the awareness of King Khalid University Hospital patients about the indications and complications of sleeve gastrectomy. The results showed obvious lack of knowledge, especially about BMI, obese BMI, and sleeve

**Table 4: Participants knowledge about complications of sleeve gastrectomy**

Characteristics	Acute complication		Chronic complication	
	Frequency (n)*	Percentages (%)†	Frequency (n)*	Percentages (%)†
Hemorrhage	290	60.4%	245	51.0%
Other nutritional and mineral deficiencies	232	48.3%	185	38.5%
Anemia	207	43.1%	185	38.5%
Iron deficiency	222	46.3%	196	40.8%
Abscess	171	35.6%	98	20.4%
Leak of gastric content	162	33.8%	165	34.4%
Weight regain	68	14.2%	115	24.0%
Neuropathies	98	20.4%	122	25.4%
Twist of stomach	95	19.8%	135	28.1%
Pulmonary embolism	68	14.2%	100	20.8%

\*responses exceed 480. †percentages exceed 100% Patient can choose more than one item

**Table 5: Correlation with educational level**

	Elementary n=13	Intermediate n=26	Secondary n=124	Bachelor n=253	Master n=47	Doctor of Philosophy n=17	Chi square p	Spearman rank correlation (p)
Gender								
male	7 (53.8%)	8 (30.8%)	71 (57.3%)	129 (51.0%)	21 (44.7%)	11 (64.7%)	0.144	0.144 (0.946)
female	6 (46.2%)	18 (69.2%)	53 (42.7%)	124 (49.0%)	26 (55.3%)	6 (35.3%)		
Heard about the body mass index (BMI)								
Yes	2 (15.4%)	7 (26.9%)	30 (24.2%)	87 (34.4%)	25 (53.2%)	3 (17.6%)	0.004	-0.136 (0.003)*
No	11 (84.6%)	19 (73.1%)	94 (75.8%)	166 (65.6%)	22 (46.8%)	14 (82.4%)		
BMI range for obese								
I don't know	11 (84.6%)	19 (73.1%)	94 (75.8%)	167 (66.0%)	21 (44.7%)	14 (82.4%)	0.003	0.135 (0.003)*
<18.5	1 (7.7%)	0 (0%)	1 (0.8%)	0 (0%)	0 (0%)	0 (0%)		
18.5-24.9	0 (0%)	1 (3.8%)	2 (1.6%)	14 (5.5%)	6 (12.8%)	1 (5.9%)		
25-29.9	0 (0%)	1 (3.8%)	13 (10.5%)	27 (10.7%)	5 (10.6%)	2 (11.8%)		
>30	1 (7.7%)	5 (19.2%)	14 (11.3%)	45 (17.8%)	15 (31.9%)	0 (0%)		
Heard about sleeve gastrectomy								
Yes	12 (92.3%)	24 (92.3%)	118 (95.2%)	248 (98.0%)	47 (100.0%)	14 (82.4%)	0.025	-0.049 (0.281)
No	1 (7.7%)	2 (7.7%)	6 (4.8%)	5 (2.0%)	0 (0.0%)	3 (17.6%)		
Heard about complications of sleeve gastrectomy								
Yes	7 (53.8%)	15 (57.7%)	73 (58.9%)	174 (68.8%)	34 (72.3%)	8 (47.1%)	0.134	-0.078 (0.089)
No	6 (46.2%)	11 (42.3%)	51 (41.1%)	79 (31.2%)	13 (27.7%)	9 (52.9%)		
Heard about indications of sleeve gastrectomy								
Yes	7 (53.8%)	11 (42.3%)	46 (37.1%)	106 (41.9%)	21 (44.7%)	6 (35.3%)	0.812	-0.015 (0.746)
No	6 (46.2%)	15 (57.7%)	78 (62.9%)	147 (58.1%)	26 (55.3%)	11 (64.7%)		

\*significant correlation

gastrectomy complications which can lead to undesirable effects upon accepting sleeve gastrectomy as the treatment option. There is a lack of knowledge in majority of the participants about sleeve gastrectomy which might be due to lack of proper patient education in our community. So, it is very important to improve patient education activities in our community and to make sure that all health messages are based on scientific evidence. In Canada, the withdrawal rate to bariatric surgery program is 25% due to multiple reasons such as awareness of the surgical risks and complications, orientation and education, postsurgery lifestyle change, and miscommunication with the family doctor.<sup>[27]</sup> Although majority have heard about sleeve gastrectomy, most of them have not heard about BMI and obese BMI. Furthermore, only 16.7% of the study population identified the correct BMI of an obese person while 67.9% failed. However, 59% of the studied population have not heard

about sleeve gastrectomy indications. However, 40.1% of the study population considered cosmetic reasons as an indication of sleeve gastrectomy. A study was conducted in Saudi Arabia to assess the public perception of bariatric surgery. The result showed that approximately 50% were unaware of the correct indications for bariatric surgery and that 41.2% were not willing to seek a bariatric surgeon's help if diagnosed with morbid obesity.<sup>[28]</sup> Moreover, a study was conducted in Turkey to assess obesity and bariatric surgery awareness. The result showed that most of the participants (55.2%) have not heard about BMI but 84.9% have heard about bariatric surgery; yet, they did not know any details about its methods, risks, and techniques.<sup>[29]</sup>

There is a lack of knowledge in majority of the participants about sleeve gastrectomy complications. While some acknowledged that hemorrhage, iron deficiency, and nutritional and mineral

deficiencies are acute complications, others acknowledged them as chronic complications of sleeve gastrectomy. A study was conducted in Canada to assess the nutritional status among the patients 5 years after sleeve gastrectomy; the results showed that 37.8% of the patients have low ferritin level and 16.4% have low Vitamin B12 levels.<sup>[30]</sup> Obesity should be managed through a multidisciplinary team, including primary care providers, to achieve desirable weight loss.<sup>[31]</sup> However, the role of primary care providers in managing obesity usually is underestimated.<sup>[31]</sup> Moreover, the primary care providers are not only involved in losing weight but also in reducing comorbidity.<sup>[32]</sup> Although there are potential barriers that lead patients with obesity to avoid routine medical care such as embarrassment and disrespectful attitude by the physician,<sup>[32]</sup> we need to increase the awareness level of people about sleeve gastrectomy indications and complications by improving patient-physician relationship, improving the communication and coordination between bariatric surgeons, family physicians, health educators, and other healthcare providers, and to conduct further community-based researches to assess people awareness about bariatric surgeries.

## Conclusion

Our study shows that there is a lack of awareness of sleeve gastrectomy indications and complications in the study population. We need to increase public awareness about sleeve gastrectomy indications and complication through proper community scientific health education.

## Limitations

The study was only conducted in one center. Therefore, the results do not represent the Riyadh region nor the entire Saudi population.

## Acknowledgment

Mohammed Khaled Ghandour, Mohammed Yousef Alyousef, Sondos Taher Alhawamdeh, Maha Mohamad Barakeh for participation as data collectors.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## References

- World Health Organization, Obesity and overweight. Geneva, Switzerland. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>. [Last Accessed on 2018 Feb 16].
- Mcgavigan AK, Murphy KG. Gut hormones: The future of obesity treatment? *Br J Clin Pharmacol* 2012;74:911-9.
- Tsigos C, Hainer V, Basdevant A, Finer N, Fried M, Mathus-Vliegen E, *et al.* Management of obesity in adults: European clinical practice guidelines. *Obes Facts* 2008;1:106-16.
- Abarca-Gómez L, Abdeen ZA, Hamid ZA, Abu-Rmeileh NM, Acosta-Cazares B, NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: A pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. *Lancet* 2017;390:2627-42.
- Kushner RF. Weight loss strategies for treatment of obesity. *Prog Cardiovasc Dis* 2014;56:465-72.
- WHO. Obesity: Preventing and managing the global epidemic. World Health Organization: Technical Report Series. WHO Tech Rep Ser no 894. 2000:252. doi: ISBN 92 4 120894 5.
- Alqarni SSM. A review of prevalence of obesity in Saudi Arabia. *J Obes Eat Disord* 2016;2:1-6.
- AlMarri F, Al Sabah S, Al Haddad E, Vaz JD. A call for more research from the Arabian Gulf. *Obes Surg* 2017;27:2034-43.
- Ministry of Health. Saudi Guidelines on the Prevention and Management of Obesity; Saudi Arabia, Riyadh; 2016. p. 1-51.
- Angrisani L, Santonicola A, Iovino P, Formisano G, Buchwald H, Scopinaro N. Bariatric surgery worldwide 2013. *Obes Surg* 2015;25:1822-32.
- Angrisani L, Santonicola A, Iovino P, Vitiello A, Zundel N, Buchwald H, *et al.* Erratum to: Bariatric surgery and endoluminal procedures: IFSO worldwide survey 2014. *Obes Surg* 2017;27:2290-2.
- Parrott J, Frank L, Rabena R, Craggs-Dino L, Isom KA, Greiman L, *et al.* American society for metabolic and bariatric surgery integrated health nutritional guidelines for the surgical weight loss patient 2016 update: Micro. *Surg Obes Relat Dis* 2017;13:727-41.
- Alfadda AA, Al-Dhwayan MM, Alharbi AA, Al Khudhair BK, Al Nozha OM, Al-Qahtani NM, *et al.* The Saudi clinical practice guideline for the management of overweight and obesity in adults. *Saudi Med J* 2016;37:1151-62.
- Seki Y, Kasama K, Hashimoto K. Long-term outcome of laparoscopic sleeve gastrectomy in morbidly obese Japanese patients. *Obes Surg* 2016;26:138-45.
- Al-Sabah SK, Almazeedi SM, Dashti SA, Al-Mulla AY, Ali DAM, Jumaa TH. The efficacy of laparoscopic sleeve gastrectomy in treating adolescent obesity. *Obes Surg* 2015;25:50-4.
- Alqahtani A, Alamri H, Elahmedi M, Mohammed R. Laparoscopic sleeve gastrectomy in adult and pediatric obese patients: A comparative study. *Surg Endosc* 2012;26:3094-100.
- Peel AL, Taylor EW. Proposed definitions for the audit of postoperative infection: A discussion paper. Surgical Infection Study Group. *Ann R Coll Surg Engl* 1991;73:385-8.
- Sakran N, Goitein D, Razieli A, Keidar A, Beglaibter N, Grinbaum R, *et al.* Gastric leaks after sleeve gastrectomy: A multicenter experience with 2,834 patients. *Surg Endosc* 2013;27:240-45.
- Gulliford MC, Charlton J, Prevost T, Booth H, Fildes A, Ashworth M, *et al.* Costs and outcomes of increasing access to bariatric surgery: Cohort study and cost-effectiveness analysis using electronic health records. *Value Health* 2017;20:85-92.
- Aurora AR, Khaitan L, Saber AA. Sleeve gastrectomy and the

- risk of leak: A systematic analysis of 4,888 patients. *Surg Endosc* 2012;26:1509-15.
21. Gagner M, Deitel M, Erickson AL, Crosby RD. Survey on laparoscopic sleeve gastrectomy (LSG) at the Fourth International Consensus Summit on Sleeve Gastrectomy. *Obes Surg* 2013;23. doi: 10.1007/s11695-013-1040-x.
  22. Sieber P, Gass M, Kern B, Peters T, Slawik M, Peterli R. Five-year results of laparoscopic sleeve gastrectomy. *Surg Obes Relat Dis* 2014;10:243-9.
  23. Van Rutte PWJ, Smulders JF, De Zoete JP, Nienhuijs SW. Outcome of sleeve gastrectomy as a primary bariatric procedure. *Br J Surg* 2014;101:661-8.
  24. Alvarenga ES, Lo Menzo E, Szomstein S, Rosenthal RJ. Safety and efficacy of 1020 consecutive laparoscopic sleeve gastrectomies performed as a primary treatment modality for morbid obesity. A single-center experience from the metabolic and bariatric surgical accreditation quality and improvement program. *Surg Endosc* 2016;30:2673-8.
  25. Rebibo L, Hakim S, Dhahri A, Yzet T, Delcenserie R, Regimbeau JM. Gastric stenosis after laparoscopic sleeve gastrectomy: Diagnosis and management. *Obes Surg* 2016;26:995-1001.
  26. Akbari K, Som R. Evaluating the quality of internet information for bariatric surgery. *Obes Surg* 2014;24:2003-6.
  27. Yang K, Zhang B, Kastanias P, Wang W, Okraniec A, Sockalingam S. Factors leading to self-removal from the bariatric surgery program after attending the orientation session. *Obes Surg* 2017;27:102-9.
  28. Altaf A, Abbas MM. Public perception of bariatric surgery. *Saudi Med J* 2019;40:378-83.
  29. Güler SA, Yılmaz TU, Şimşek T, Yirmibeşoğlu O, Kırnaz S, Utkan NZ, *et al.* Obesity and bariatric surgery awareness in the Kocaeli province, a leading industrial city in Turkey. *Turkish J Surg* 2018;34:165-8.
  30. Caron M, Hould FS, Lescelleur O, Marceau S, Lebel S, Julien F, *et al.* Long-term nutritional impact of sleeve gastrectomy. *Surg Obes Relat Dis* 2017;13:1664-73.
  31. Semlitsch T, Stigler FL, Jeitler K, Horvath K, Siebenhofer A. Management of overweight and obesity in primary care—A systematic overview of international evidence-based guidelines. *Obesity Reviews* 2019;20:1218-30.
  32. Durrer Schutz D, Busetto L, Dicker D, Farpour-Lambert N, Pryke, R, Toplak H, *et al.* European practical and patient-centred guidelines for adult obesity management in primary care. *Obesity Facts* 2019;12:40-66.