

Upper gastrointestinal tract involvement in the management of bariatric patients in the Kingdom of Saudi Arabia

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Abstract

Background Preoperative esophagogastroduodenoscopy (EGD) may affect the management of bariatric patients although this is not consistent universally. The present prospective study evaluated the effect of preoperative EGD findings in obese Saudi patients, including upper digestive symptoms (UDS) and comorbidities, on their planned surgery.

Methods From January 2018 to May 2019, we conducted a 4-center retrospective observational study to evaluate the endoscopic findings among Saudi patients aged 18-65 years with a body mass index (BMI) >40 kg/m². Preoperative data included UDS, comorbidities, *Helicobacter pylori* (*H. pylori*) infection assessed during a histopathological examination, and EGD findings.

Results 717 patients underwent EGDs, and 432 underwent bariatric surgery. The mean BMI was 44.3±6.3 kg/m², and the mean age was 27.8±11.8 years. The overall UDS prevalence was 49%, with the most frequent being gastroesophageal reflux disease 54% (387/717), followed by dyspepsia 44% (315/717). *H. pylori* infection was detected in 287/672 (42.4%) patients. The total percentage of patients with normal EGD was 36% (258/717). A delayed bariatric procedure was performed in 15% of the patients for the following reasons: 2.3% had large polyps of >1 cm (either hyperplastic or cystic polyps); 1.62% had esophagitis grade C and D based on the Los Angeles classification; 0.7% had Barrett's esophagus; and 5.7% had peptic ulcer disease.

Conclusions Our findings confirmed that obesity carries a profound health burden with a significant impact on health expenditures. Routine preoperative EGD in the obese Saudi population appears to be mandatory to identify factors that may change, delay, or postpone the bariatric procedure.

Keywords Bariatric surgery, morbid obesity, *Helicobacter pylori*, endoscopic findings, delayed or postponed surgery

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Conflict of Interest: None

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Introduction

In Saudi Arabia, obesity is a serious problem with an increasing prevalence; 30% of men and 44% of women are obese. Saudi Arabia has the 11th highest adult obesity rate among 188 countries [1]. Laparoscopic sleeve gastrectomy (LSG) and laparoscopic Roux-en-Y gastric bypass (RYGB) are used to resolve the problem of obesity in Saudi Arabia effectively [2]. The current endoscopic devices such as

1 endoscopy gastroplasty with Apollo OverStitch Device, an
 2 FDA-approved device, that provide a more cost-effective and
 3 minimally invasive intervention are not widely accessible in
 4 the country [3]. Furthermore, according to American and
 5 European guidelines, a routine esophageal gastroduodenal
 6 endoscopy (EGD) is recommended for all candidates as
 7 part of the preoperative workup in morbidly obese patients
 8 who plan to undergo bariatric surgery [4,5]. However, it is
 9 still controversial whether or not to regularly screen obese
 10 patients before surgery. For all obese patients before bariatric
 11 procedures, several researchers suggested that an EGD be
 12 performed due to a lack of consistency between patient
 13 symptoms and outcomes. Also, they recommend routinely
 14 checking for *Helicobacter pylori* (*H. pylori*) and eradicating
 15 the bacteria before planning a bariatric procedure, although
 16 such data are limited [6]. However, due to the invasiveness and
 17 cost of EGD, some researchers recommend a selective strategy
 18 toward EGD for obese patients, as asymptomatic patients
 19 demonstrate poor clinical relevance concerning most of the
 20 lesions identified in a routine EGD [7,8].

21 Unfortunately, there are limited and inconsistent data
 22 about abnormal endoscopic findings that may influence
 23 the management of obese patients undergoing bariatric
 24 surgery. Moreover, the prevalence of abnormal endoscopic
 25 findings in obese patients considered for bariatric surgery is
 26 reported to be insufficient compared to that of the non-obese
 27 population [9,10]. Additionally, the frequency of *H. pylori*
 28 infection in obese patients remains unclear.

29 This study aimed to report the patient characteristics,
 30 comorbid conditions, and symptoms at the time of pre-
 31 endoscopy, and to evaluate the prevalence of abnormal upper
 32 gastrointestinal (GI) endoscopic findings in obese Saudi
 33 patients before bariatric procedures. Moreover, we aimed
 34 to report the prevalence of *H. pylori* infection in the obese
 35 population and to record the potential risk factors for changing
 36 the surgery approach.

37 38 39 40 Patients and methods

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42 The study was reviewed and approved by the Prince Sattam
 43 bin Abdulaziz Institutional Review Board (PASU/COM/
 44 RC/A/45). Besides, the ethical approval of each hospital was
 45 obtained for database management.

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Study design and patients

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2
3 This was a retrospective study that reviewed the database
 4 of 1,129 patients who underwent bariatric surgery (LSG or
 5 RYGB) in Hail and Al-Kharj, Saudi Arabia, during the period
 6 between March 2018 and August of 2019. The data were
 7 collected in the bariatric clinics of King Salman Specialist
 8 Hospital in Hail, and Al-Kharj Military Hospital included only
 9 adult obese Saudi patients who fulfilled the criteria for surgery
 10 and who enrolled in the study once they provided informed
 11 consent. Regarding the assessment of patients, data was
 12 collected from the registry, database center medical records
 13 review, and clinical evaluations. Body mass index (BMI) was
 14 clinically measured.

15 Inclusion criteria were: Saudi patients aged 18-65 with a
 16 BMI >35 kg/m²; failure of many attempts of dietetic regimens;
 17 a record of comorbidities; and an acceptable level of surgical
 18 risk. Exclusion criteria were: evidence of non-compliance
 19 with the perioperative regimen or a prohibitive surgical risk;
 20 uncontrolled alcohol or drug dependence; uncontrolled
 21 depression or other psychiatric illnesses; and lack of family
 22 support or the existence of serious family discord about the
 23 proposed operation.

24 25 26 27 Data collection and management

28
29 We retrospectively checked the medical records of all
 30 morbidly obese patients before bariatric surgery that included
 31 characteristics of patients, comorbidities, and endoscopic
 32 and histological findings. In addition, we collected the GI
 33 symptoms, which included gastroesophageal reflux disease
 34 (GERD) symptoms such as heartburn, regurgitation, chest
 35 pain, dysphagia, and dyspepsia symptoms such as nausea
 36 with or without vomiting, epigastric pain or burning,
 37 bloating, and abdominal pain. All patients who underwent
 38 EGD had 3 endoscopic gastric biopsy specimens for the
 39 identification of *H. pylori* infection, 2 from the antrum,
 40 and 1 from the body. A histological identification based on
 41 normal hematoxylin and eosin stain was used to confirm the
 42 presence of *H. pylori*. The main indication for endoscopy was
 43 preoperative evaluation. Regarding the endoscopic finding's
 44 classification, we used the categorization of Sharaf et al, [11]
 45 who classified it to group 0, group 1, group 2, group 3, and
 46 group 4.

47 48 49 50 Statistical analysis

51
52 We used a commercially available version of Statistical
 53 Package of Social Science (SPSS version 22 for Windows;
 54 SPSS Inc, Chicago, IL). Continuous data were presented
 55 as mean and standard deviation (SD) and were compared
 56 using a Student's *t*-test or a nonparametric test. Categorical
 57 variables were presented in frequency and percentage and
 58 were analyzed using the χ^2 or Fisher's exact tests. Analysis

of the logistic regression was used to define preoperative predictors that could be associated with abnormal endoscopic outcomes. A 2-tailed $P < 0.05$ was considered to be statistically significant.

Results

Demographics and clinical characteristics

Of the 717 patients who underwent EGDs, 432 underwent bariatric surgery. The majority of the performed bariatric procedures were LSG 412 (95.37%), followed by RYGB 20 (4.62%). The mean BMI was 44.3 ± 6.3 kg/m², and the mean age was 27.8 ± 11.8 years old. The predominant gender was female (65%). Overall, 38% had one or more comorbid diseases. Females had a higher prevalence of any comorbidity (65.8% vs. 57.8%) compared with males. Those with more comorbidities were significantly older ($P = 0.004$). There was a significant difference in age groups between those without comorbidities (23.3 years, 95% confidence interval [CI] 32.8-34.1), vs. those with 1 comorbidity (27 years, 95%CI 32.7-35.6), and those with more than 2 comorbidities (36 years, 95%CI 34.9-36.7). Regarding upper GI symptoms (UGIS), the overall prevalence was 38%. The prevalence of GERD symptoms was 387 (54%), followed by dyspepsia symptoms, which were present in 315 (44%) obese patients considered for bariatric surgery. The most commonly reported comorbidity, in over half of the patients, was diabetes mellitus type II (57%), followed by hypertension (50%), osteoarthritis (35%), hypothyroidism (34%), and chronic back pain (33%). Depression and anxiety were less frequently reported (11%). Obesity-related comorbidities are shown in Table 1.

EGD findings

All the 717 obese Saudi patients were routinely evaluated with a preoperative EGD, including a biopsy, in the dedicated bariatric centers before bariatric surgery, as shown in Table 2. Preoperative EGD revealed abnormalities in 459 (64%) patients. The most common endoscopic finding was hiatal hernia (HH) in 308 (43%) patients, followed by gastritis (42%), and esophagitis (14.4%). Pre-bariatric EGD showed HH with the presence of esophagitis and GERD symptoms in 64 (14.8%) of the 432 patients who underwent bariatric surgery. Of those patients, 30 (9.7%) underwent LSG; GERD symptoms improved in 21 (70%) and worsened in the other 9 (30%).

The total patients in group 0 with normal EGD were 258 (36%) of the 717 who underwent EGD. These patients were either on the waiting list or underwent bariatric surgery without a delay or modified procedure.

In group 1, 367 (51.2%) patients of the 717 who underwent EGD had abnormal EGD findings such as mild esophagitis, gastritis, duodenitis, and esophageal web. However, of those who planned to undergo bariatric surgery in group 1, 138

Table 1 Obesity-related comorbidities

Characteristics		N	%
Upper gastrointestinal symptoms	GERD	387	54
	Dyspepsia	315	44
	Dysphagia	15	2
Cardiovascular disease	Hypertension	361	50
	Coronary artery disease	65	9.1
Pulmonary diseases	Asthma/COPD	57	8
Endocrine diseases	Diabetes mellitus	408	57
	Hypothyroidism	243	34
Mental diseases	Depression/anxiety	79	11
Bone diseases	Osteoarthritis	250	35
	chronic back pain	236	33
Other functional disorders	Abdominal pain, IBS-like	82	11.4
Other diseases	Anemia	19	2.6
	Cancer	15	2.1

GERD, gastroesophageal reflux disease; COPD, chronic obstructive pulmonary disease; IBS, irritable bowel syndrome

Table 2 Abnormal findings from EGD of enrolled patients before bariatric procedure

Abnormal EGD findings*		N	%
Esophagus	HH	308	43
	Large HH >4 cm	27	3.8
	Esophagitis	103	14.4
	LA classification: A/B/C/D	59/37/6/1	57.3/36/5.8/0.9
	Barrett's esophagus	3	0.4
	Varices	7	0.8
Stomach	Atrophic gastritis	8	1.2
	Erosive gastritis	64	8.9
	<i>H. pylori</i> (+) gastritis	286	42.1
	Ulcers	9	1.25
	Polyps/large >1cm	56/10	7.8/1.4
Duodenum	Duodenitis	29	4
	Ulcers	16	2.2
Cancer		2	0.7
Total		459	64

*Almost a third reported had more than one endoscopic abnormal finding

HH, hiatal hernia; LA, The Los Angeles Classification; EGD, esophagogastroduodenoscopy; *H. pylori*, *Helicobacter pylori*

(31.9%) of 432 neither changed the surgical approach nor postponed it because of these endoscopic findings.

Patients with delayed bariatric procedure had: large polyps of >1 cm (either hyperplastic or cystic polyps) 10 (2.3%); esophagitis Los Angeles class C/D 7 (1.62%); Barrett's esophagus 3 (0.7%); and peptic ulcer disease 25 (5.7%). The total number

1 of patients in group 2 in whom the bariatric procedure was
 2 changed or delayed (due to mass mucosal/submucosal lesions,
 3 peptic ulcer disease, severe erosive esophagitis, Barrett's
 4 esophagus, HH of any size, peptic stricture, Zenker's diverticula,
 5 and arteriovenous malformations) were 65 (15.04%).

6 A modified bariatric procedure was carried out in 30 of 64
 7 (47%) patients with medium-sized and large HH with GERD
 8 symptoms and esophagitis. They underwent RYGB, while the rest
 9 refused to change the bariatric procedure and underwent LSG,
 10 the most popular bariatric procedure in Saudi Arabia. Peptic
 11 ulcer operation postponed the bariatric surgery and medications
 12 prescribed until a follow-up endoscopy confirmed full healing.

13 A bariatric procedure was contraindicated and thus
 14 postponed in patients with varices 7 (0.97%) and malignant
 15 lesions 2 (0.27%). The total number of patients in group 3 with
 16 absolute contraindications for surgery, such as upper GI cancer
 17 or varices, was 9 (1.26%). *H. pylori* infection was assessed
 18 during the histopathological examinations of 672 (42.4%)
 19 patients; 287 were tested positive. There was a significant
 20 variation in *H. pylori* infection in obese patients between Al-
 21 Kharj and Hail hospitals 102/147 (69%) vs. 185/525 (35%),
 22 $P < 0.001$, respectively (Fig. 1,2).

23 The mean age for *H. pylori*-positive patients was 39.6 ± 12.03
 24 years, while the mean age for *H. pylori*-negative patients was
 25 31.3 ± 9.3 years ($P = 0.01$). Older people were more likely to have
 26 *H. pylori* infection. In obese patients at Al-Kharj, 43 (29.5%)
 27 males and 104 (70.1%) females were *H. pylori*-positive, while
 28 among those at Hail, 69 (37.3%) males and 116 (62.7%) females
 29 were *H. pylori*-positive. *H. pylori* infection was more prevalent
 30 in Hail ($P < 0.001$), and there was not a significant difference
 31 between males and females between the 2 cities ($P = 0.0587$).
 32 Fig. 3 presents the change of bariatric surgery based on pre-
 33 endoscopy findings.

34
 35
 36
 37 **Discussion**

38
 39 The objective of this study was to evaluate the rate of
 40 comorbidities related to obesity in the Saudi population.
 41 Nonetheless, this analysis offers an approximate estimation of
 42 the frequency of comorbidities attributed to obese Saudis. The
 43 most commonly reported comorbidity, in over half of patients,
 44 was diabetes mellitus type II, followed by hypertension and
 45 osteoarthritis. Depression and anxiety were less frequently
 46 reported. The most frequent UGIS in obese patients considered
 47 for bariatric surgery were GERD and dyspepsia symptoms.
 48 Women were more likely to report a comorbidity. Our results
 49 indicate that obesity is a significant health burden.

50 Few studies worldwide have shown a high prevalence of
 51 *H. pylori* ranging between 11-39% in Europe and 61% in USA
 52 in morbidly obese patients undergoing bariatric surgery [12-17].
 53 Also, few studies looked only at the *H. pylori* serologies, which
 54 might not reflect an active infection [17]. This study showed an
 55 exceptionally high prevalence of the infection in an unselected
 56 group of morbidly obese patients in a relatively young age group
 57 who have undergone EGD before weight reduction surgeries. The
 58 explanation of such a high prevalence is not clear and has not

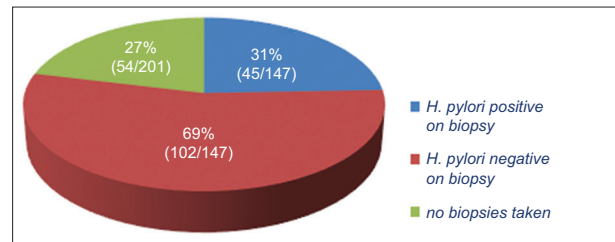


Figure 1 Prevalence of *Helicobacter pylori* (*H. pylori*) among bariatric patients in Al-Kharj

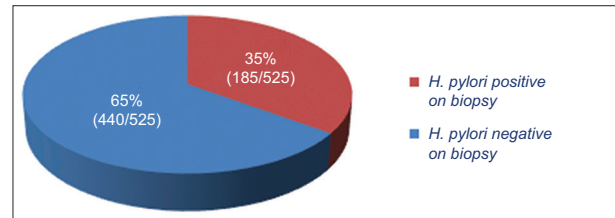


Figure 2 Prevalence of *Helicobacter pylori* (*H. pylori*) among bariatric patients in Hail

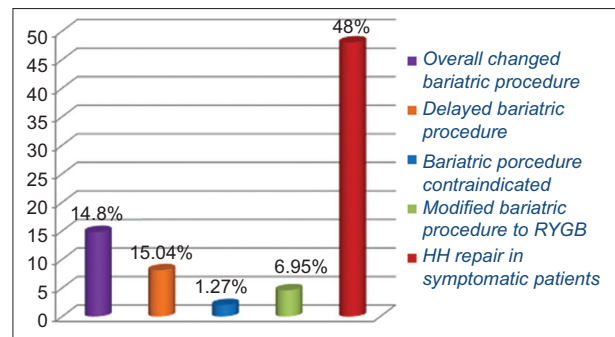


Figure 3 Change of bariatric surgery based on pre-endoscopy findings HH, hiatal hernia; RYGB, Roux-en-Y gastric bypass

38 been clarified. In our study, about two-thirds of obese individuals
 39 were infected with *H. pylori* in Al Kharj, but the rate was only one-
 40 third in Hail ($P < 0.001$). Finally, the frequency of *H. pylori* was
 41 significantly higher in obese females in both Hail and Al-Kharj
 42 compared to males ($P = 0.002$). In patients with different biopsy-
 43 proven GI conditions, such as gastritis, peptic ulcer disease, and
 44 gastric cancer, the prevalence of *H. pylori* in Saudi Arabia was
 45 71.33%, with a slight female predominance [18].

46 In a recent study in Al-Kharj [19], a total of 474 Saudi
 47 patients with functional dyspepsia according to the ROME IV
 48 criteria were screened for *H. pylori* infection through the use
 49 of the urea breath test. The study showed a high prevalence
 50 of *H. pylori* infection in 182 of 474 (38.5%) patients with
 51 dyspepsia living in the central rural region of Saudi Arabia.
 52 The frequency of *H. pylori* infection among females in the Al-
 53 Kharj region was estimated as 102 of 164 (62.2%) compared
 54 to 80 of 128 (62.5%) in males ($P = 0.63$). The majority of the
 55 *H. pylori*-infected patients were in the age group 22-44 years
 56 old (67.9%). Another study by Aleid et al [20] demonstrated
 57 that the prevalence of *H. pylori* in patients assigned to upper GI
 58 endoscopy following bariatric surgery in Riyadh was 39%. This

finding was quite similar to our Hail's patients (35%) but much lower than Al-Kharj (69%). This heterogeneity among Saudi Arabia regions is due to several factors, including personal hygiene, healthcare system, and socioeconomic status.

In a group of morbidly obese Saudi patients with chronic active gastritis, the prevalence of *H. pylori* infection was high (85.5%). Interestingly, the prevalence of *H. pylori* infection was similar in patients with and without comorbid conditions. The main endoscopic findings were gastric erosions in 13%, HH in 13%, and gastritis in 67.7%, with no records of duodenal or gastric ulcers [21].

Our study showed that one-third of the patients had normal EGD findings following successful bariatric surgeries without delay or a modified procedure. Almost half of the patients had abnormal EGD findings; however, these findings were mild. Only 15% delayed the decision plan for bariatric surgery. Patients with HH were subjected to modified surgery to repair and reduce the hernia. Esophagitis, gastric ulcers, duodenal ulcers, and polyps led to the postponement of the operation. Medications were administered after a follow-up endoscopy confirmed complete recovery. Abnormal findings of EGD in those patients with UGIS were high. A recent systematic review of 48 studies showed that the proportion of EGDs resulting in a change in surgical management was 7.8%. Of them, 221 (44.9%) were HH repairs, and 201 (40.8%) were delays in surgery due to gastritis or peptic ulcer disease. Moreover, 37 (7.5%) patients required major changes in the planned procedure, such as switching from RYGB to LSG or adding a gastrectomy to a RYGB, and 4 (0.8%) were cancellations due to esophageal cancer or varices [22]. Similarly, another meta-analysis of 28 studies demonstrated that 7.6% of the enrolled patients had findings that delayed/altered surgery. Moreover, they showed that the most common findings were gastritis, HH, *H. pylori*, and esophagitis [23].

The main limitation of this observational study on the role of routine preoperatively EGD in bariatric patients was the retrospective design, which may aggravate the risk of recall bias. We could not compare the types of bariatric surgery in terms of EGDs due to the unequal distribution of our sample. Another limitation was the predominance of females in our population. Finally, it is very important that current endoscopic treatments for obesity such as endoscopic gastroplasty with Apollo OverStitch Device, which is non-invasive compared to surgical sleeve gastrectomy, is not accessible in our centers as in the majority of bariatric centers across the country. Therefore, data on the role of routine EGD before endoscopic gastroplasty is not available although its role is equally important to preoperative EGD.

In conclusion, GERD and HH are highly prevalent in obese patients. Variable rates of *H. pylori* infection in the bariatric population were recorded throughout Saudi Arabia. Endoscopic and histologic findings were shared in preoperative EGDs but did not significantly change the planned surgical procedure. Routine, preoperative EGD assessment in the obese Saudi population is obviously mandatory not only to identify the specific individual anatomy, but also to exclude early asymptomatic lesions or even early gastric cancer. A campaign should be developed to increase the awareness of Saudi populations towards the complications of LSG.

Summary Box

What is already known:

- A routine preoperative esophagogastroduodenoscopy (EGD) is recommended for all morbidly obese patients who plan to undergo bariatric surgery although some researchers recommend a selective strategy toward EGD for obese patients
- Routinely screening for *Helicobacter pylori* (*H. pylori*) and eradicating it before planning a bariatric procedure is recommended, although such data are limited
- There are limited and inconsistent data about abnormal endoscopic findings that may influence the management of obese patients undergoing bariatric surgery

What the new findings are:

- Routine, preoperative EGD assessment in the obese Saudi population is mandatory not only to identify the specific individual anatomy, but also to exclude early asymptomatic lesions or even early gastric cancer
- Our findings (demographic data, comorbid conditions, symptoms) confirmed that obesity carries a profound health burden in Saudi Arabia
- Variable rates of *H. pylori* infection in the bariatric population were recorded throughout Saudi Arabia

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