Original Article

The utility of esophagogastroduodenoscopy and *Helicobacter pylori* screening in the preoperative assessment of patients undergoing bariatric surgery: A cross-sectional, single-center study in Saudi Arabia

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Abstract

Background/Aim: Esophagogastroduodenoscopy (EGD) and *Helicobacter pylori* screening are routine parts of the preoperative assessment of patients undergoing bariatric surgery at many centers around the world. The reason for this step is to identify abnormalities that may change the surgical approach. In this study, we aim to evaluate the extent to which endoscopic findings and *H. pylori* testing affect the plan of care in bariatric patients.

Patients and Methods: We retrospectively reviewed the investigational processes of 356 patients planned for bariatric surgery (2014–2016) at our center. Patients were categorized into two main groups (4 subgroups) from endoscopic findings. One group included patients with normal EGD and patients who had abnormal findings that did not change the surgical approach, whereas the other included patients who had findings that changed or canceled the surgical plan. A logistic regression analysis was used to evaluate how strongly can factors such as patient demographics, BMI, comorbidities, symptomatology, and *H. pylori* status predict the risk of having plan-changing endoscopic abnormalities.

Results: The ages ranged between 15 and 66 years with a mean ± SD of 37 ± 11 years, and 56% were females. The majority of patients (75%; 95% CI: 73 – 82%) had either no findings (41%) or had abnormalities that did not change the surgical approach (34%). Only 25% (95% CI: 21–29%) were found to have pathologies that altered the surgical approach, and 0.6% of them had findings that were considered contraindications for surgery. In spite the relatively high prevalence of *H. pylori* in our cohort (41%; 95% CI 36–46%), the proportion of patients who had plan-changing abnormalities did not differ markedly from other studies. Gastroesophageal reflux disease (GERD) and obstructive sleep apnea symptoms were the only significant predictors of EGD findings ($P = 0.009$).

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Conclusions: GERD and sleep apnea symptoms can be strong predictors of EGD abnormalities. However, this evidence is still not enough to safely recommend changing the current practice. Therefore, until a sensitive clinical prediction score is derived and validated according to the symptoms, we suggest that EGD should continue as the standard of care in all patients undergoing bariatric surgery.

Keywords: Bariatric surgery, esophagogastroduodenoscopy, *Helicobacter pylori*, preoperative assessment

INTRODUCTION

Overweight and obesity are both a global epidemic and a major public health issue in Saudi Arabia.[1] According to the 2017 Global Health Observatory report by the World Health Organization (WHO), 35% of the adult Saudi population are obese [i.e., have a body mass index (BMI) ≥ 30 kg/m^2].[2] Conservative management of obesity can sometimes induce 5–10% weight loss and even provide cardiometabolic benefit.[3] However, because of the successful outcomes and durable results of the surgical management, it is now recommended in the American Society for Metabolic and Bariatric Surgery (ASMBS) guidelines for patients with a BMI of 40 and above with or without coexisting comorbidities, and for patients with a BMI ≥ 35 with severe obesity-related medical conditions or remarkably impaired quality of life.[4]

The preoperative evaluation of patients undergoing bariatric surgery is a multidimensional assessment that consists of history, physical examination, routine laboratory investigations, nutrient screening, psycho-behavioral evaluation, and an endocrine, cardiopulmonary, and gastrointestinal (GI) evaluation. According to the ASMBS guidelines,[4] the gastrointestinal evaluation of bariatric patients must include screening for *H. pylori* in high prevalence areas, and if clinically indicated, an upper GI endoscopy (EGD). However, EGD continues to be part of the standard preoperative protocols at many centers worldwide regardless of patient symptomatology. This practice could be partially owing to the existing evidence suggesting that endoscopic findings can influence or even entirely change the surgical plan in up to 25% of patients.[5,6] In Saudi Arabia, it could also be partly owing to the common belief that *H. pylori* infection, which demands treatment before surgery,[4] is highly prevalent, with estimates ranging between 27–50% and even reaching 85% in some studies.[7-10] Nonetheless, population-based data on *H. pylori* prevalence in Saudi Arabia are scarce, and the most impactful studies in this context were either limited to the pediatric age group[7-9] or focused on symptomatic patients at tertiary care centers.[8-10] This method of sampling can lead to a significant overestimation of the prevalence of interest and limit the external validity of these studies. With that in mind, it would be too hasty to assume that the reported high prevalence of *H. pylori* in Saudi Arabia is associated with a higher probability of abnormal EGD findings in morbidly obese patients.

In this paper, using data from a single, high-volume, tertiary-care center in Riyadh, we primarily aim to investigate how likely can routine preoperative EGD affect the plan of care in patients undergoing bariatric surgery. Additionally, we evaluate how strongly can factors such as patient demographics, BMI, comorbidities, and symptomatology predict the risk of having *H. pylori* infection or plan-changing endoscopic findings. Finally, we assess whether the high prevalence of *H. pylori* in Saudi Arabia, as reported in previous studies, affects the number and types of endoscopic abnormalities found in this patient population.

PATIENTS AND METHODS

This study is a cross-sectional evaluation of the preoperative utility of EGD in patients undergoing bariatric surgery at a single tertiary care center in Riyadh, Saudi Arabia. In this study, we retrospectively reviewed the medical records of all patients referred to the endoscopy unit before surgery. The sampling was consecutive and took place over 3 years (2014–2016). Data collected included patient demographics (i.e., age and gender), BMI, comorbidities, and preoperative clinical evaluation (signs and symptoms) as explanatory variables, and *H. pylori* status and EGD findings as outcome variables.

Owing to the existing evidence that suggests a correlation between upper GI[6] and gastroesophageal reflux disease (GERD) symptoms[11] and plan-changing EGD abnormalities, these symptoms were of particular interest when we reviewed the patients' medical records. However, our review was not limited to them. Instead, we included all the possible GI symptoms of EGD abnormalities that would have altered the surgical approach [Table 1]. In addition, because some of these conditions can sometimes have atypical presentations, we documented all the cardiac and respiratory symptoms as well. The list included but was not limited to heartburn, acid regurgitation, dysphagia,

odynophagia, cough, shortness of breath, chest pain, abdominal pain, nausea, vomiting/hematemesis, change of stool color, constitutional symptoms, and any other signs and symptoms of chronic liver disease or GI malignancy. After this information was documented, we noticed that many of our patients exhibited symptoms that followed repetitive patterns of GERD and obstructive sleep apnea (OSA). Therefore, when these patterns were present, they were entered in the analysis as such. The patient's presentation was attributed to GERD when they experienced typical symptoms (i.e., acid/food regurgitation and heartburn), or non-specific/extra esophageal symptoms (e.g., epigastric pain or fullness, respiratory symptoms, etc.) with a previous test result that confirmed the diagnosis (EGD or barium study).[12] On the other hand, the clinical presentation was attributed to OSA when the patient qualified as intermediate or high risk on the STOP-BANG questionnaire.[13]

The EGD reports were reviewed afterwards, and the patients were categorized into two main groups (four subgroups) according to the results.

- Approach unchanged, which included patients with:
  - A. A normal study
  - B. Abnormal findings that did not change the surgical approach nor postponed surgery
- Approach changed
  - C. Abnormal findings that changed the surgical approach or postponed surgery
  - D. Abnormal findings that were considered absolute contraindications for surgery.

The classification system for endoscopic findings was based on Table 1.[5]

Table 1: Classification system for endoscopic findings[5]

Classification system for endoscopic findings
Group 0: No findings
Normal study
Group 1: Abnormal findings that do not change surgical approach/ postpone surgery
Mild esophagitis, gastritis, and/or duodenitis
Esophageal webs
Group 2: Findings that change the surgical approach/postpone surgery
Mass lesions (mucosal/submucosal)
Ulcers (any location)
Severe erosive esophagitis, gastritis, and/or duodenitis
Barrett's esophagus
Bezoar
Hiatal hernia (any size)
Peptic stricture
Zenker's diverticula
Esophageal diverticula
Arteriovenous malformations
Group 3: Absolute contraindications to surgery
Upper GI cancer
Varices

As a descriptive study with a dichotomous primary outcome (i.e., change vs. no change in the surgical plan according to EGD findings), the sample size would be determined by the expected proportion of patients who would end up with a change in their surgical plan from EGD findings, desired precision (total width) of the confidence interval (CI), and the confidence level. Considering the existing evidence on the subject, the highest estimate of the proportion of interest is 25%. With a 10% desired total width of CI, we would need 288 patients to draw and have results with a 95% confidence level.

Statistical analysis

Using the IBM SPSS statistical analysis software, categorical variables were analyzed and reported as numbers and percentages, whereas numerical variables were summarized with the sample mean and standard deviation (SD). The proportions of each category of the EGD findings mentioned above were all reported along with their 95% CIs.

To determine the significant predictors of our outcome variables, we built two binary logistic regression models. The first was built to evaluate whether patient demographics, BMI, comorbidities, and symptoms had any statistically significant associations with *H. pylori* infection. The second model, however, was made using the same variables, including *H. pylori* status, to predict the chance of having plan-changing endoscopic abnormalities on EGD. An alpha level of 0.05 was used to label an independent variable statistically significant.

RESULTS

During the study period, a total of 356 patients, of whom 201 (56%) were females, were referred to the endoscopy unit for preoperative EGD before laparoscopic sleeve gastrectomy and Roux-en-Y gastric bypass. The ages of the participants ranged between 15 and 66 years with a mean ± SD of 37 ± 11 years. The average BMI and SD of patients in our sample was 48.1 ± 10 kg/m^2.

A retrospective review of the EGD reports showed that the majority of patients (276 patients, 75%; 95% CI: 73–82%) did not have any abnormalities that would have altered their surgical plan [Figure 1]. Among this group, 146 patients (41%; 95% CI: 36–46%) had unremarkable EGD studies, and 120 (34%; 95% CI: 29–39%) had abnormalities that were insignificant with regard to the surgical approach. However, 90 patients in our sample (25%; 95% CI: 21–29%) were found to have pathologies that altered the surgical plan. In the

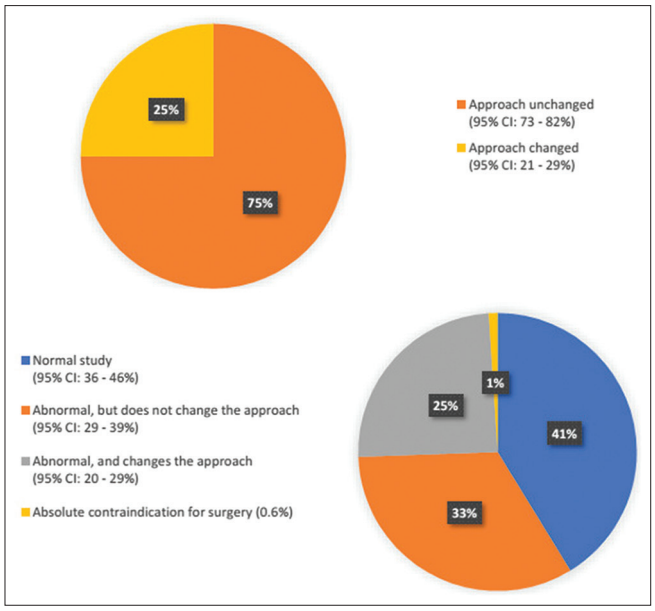

Figure 1: Group distributions in our cohort according to the EGD findings and change in surgical approach

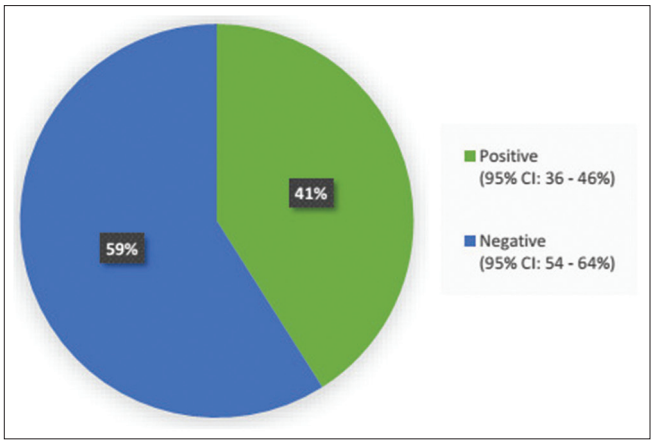

Figure 2: *H. pylori* prevalence in our cohort

latter group, 89 patients (24.4%; 95% CI: 20–29%) had approach-changing but not surgery-canceling findings, and only two of them (0.6%) had findings that were considered contraindications for surgery. The breakdown of each group from EGD findings is shown in Table 2. Our review of the pathology reports also showed that 146 patients (41%; 95% CI 36 – 46%) were *H. pylori* positive [Figure 2].

Because some patients in our sample had missing or ambiguous records with regard to their symptoms, 131 cases were excluded from our regression analysis. After excluding them, we used the data of the remaining 225 patients to build two saturated binary logistic regression models, and ascertain how strongly our independent variables were able to predict *H. pylori* status and plan-changing EGD abnormalities. In the first model, which focused on predicting the status of *H. pylori* infection according to the patient's age, gender, BMI, comorbidities, and symptoms, none of these factors was statistically significant. Figure 3 shows the receiver operating characteristic curve (ROC) for this model and provides the same finding that none of our predictor variables increased the sensitivity of the null model enough to predict *H. pylori* status. The second regression model, however, in which we incorporated *H. pylori* status as an independent variable, the patients' symptoms, particularly GERD and sleep apnea symptoms, were the only significant/strong predictors of EGD findings ($P = 0.009$). Although far from ideal, our regression model had a predictive power of 78% with all the variables we considered in this study. However, this was only a marginal increase from the predictive power of the null model (the model that predicted the change in

Table 2: Endoscopic findings in our cohort

Findings	Number	Percentage	95% CI*
Approach unchanged	276	75%	73-82%
a. Normal	146	41%	36-46%
b. Abnormal but does not affect the approach	120	34%	29-39%
Esophagitis (LA* grade A and B)	13	3.7%	2-6%
Erosions	45	12.6%	9-16%
Polyps, nodular mucosa, and enlarged gastric folds	23	6.5%	4-9%
Gastritis	12	3.4%	1-5%
Hyperemia	27	7.6%	5-10%
Approach changed	90	25%	21-29%
c. Abnormal, and changes the surgical approach	88	24.4%	20-29%
Esophagitis (LA Grade C&D)	1	0.3%	NA
Hiatal hernia	65	18%	14-22%
Barret's esophagus	7	2%	NA
Ulcer	15	4%	2-6%
d. Absolute contraindication	2	0.6%	NA
Esophageal varices	1	0.3%	NA
Mass lesion	1	0.3%	NA
Total	357	100%	

*Los Angeles classification. *Confidence interval

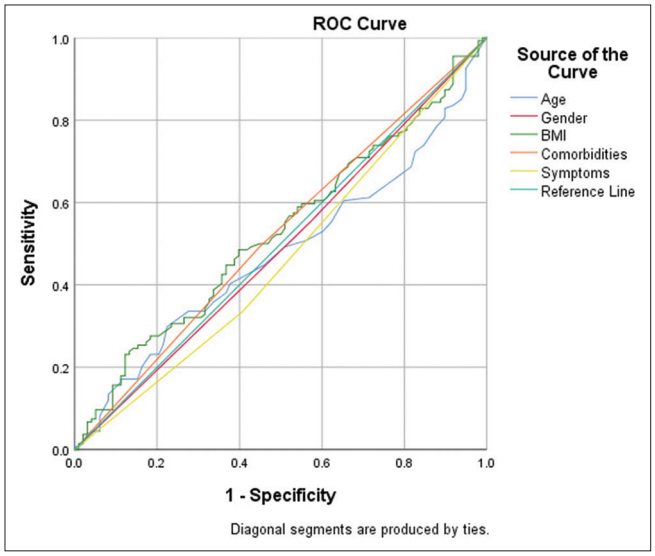

Figure 3: ROC of model-1 (Prediction of *H. pylori* status)

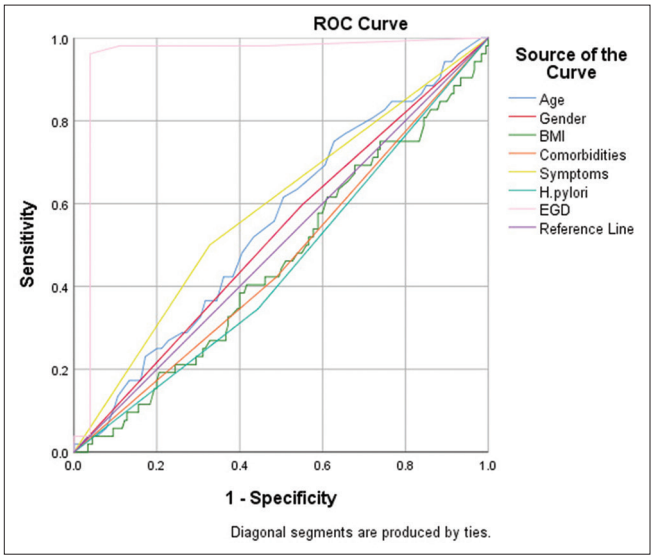

Figure 4: ROC of model-2 (prediction of the change in the surgical approach)

surgical approach without explanatory variables), which had a predictive power of 75%. These findings are presented in the ROC shown in Figure 4, which shows that of all the variables we included the patient's symptoms were the only variable that increased the sensitivity of our prediction apart from EGD. Nevertheless, an area under the curve of 0.6 denotes that the symptoms we analyzed were not enough, and a better model according to the clinical picture is needed to improve our prediction.

DISCUSSION

GI evaluation is an essential component of the preoperative investigational process in patients undergoing bariatric surgery. The guidelines for GI assessment of bariatric patients state that it must include a screening for *H. pylori* if the patient comes from a high prevalence area. In addition, if clinically significant symptoms are present, the patient should go through an appropriate evaluation with imaging studies, upper GI (UGI) series, or an upper endoscopy (EGD).[4]

The main reason screening for *H. pylori* is recommended in patients undergoing bariatric surgery is to minimize the chance of postoperative complications such as viscus perforation and marginal ulcers.[14,15] When it comes to EGD, however, the existing evidence shows broad and sometimes controversial estimates with regard to its effects on the surgical approach. Some citations suggest that 5% of patients can have a change in their surgical plans from EGD findings,[15] whereas other studies reported estimates up to 25%.[5,6]Additionally, many authors documented a lack of correlation between patients' symptoms and endoscopic abnormalities.[16] With that in mind, and considering the extremely high estimates of *H. pylori* prevalence in Saudi Arabia, one can assume that EGD with *H. pylori* screening would have a significant impact on the surgical approach and outcome in patients undergoing bariatric surgery. Upper endoscopy and *H. pylori* screening, therefore, continue to be integral parts of the preoperative assessment of bariatric patients at many centers regardless of their symptomatology. However, little evidence exists to conclusively answer the debate around this practice.

In this paper, we analyzed a consecutive sample of 356 patients referred to our endoscopy unit for preoperative EGD. We used the classification system suggested by Sharaf *et al.* to determine whether an endoscopic finding would be clinically relevant or not.[5] Similar to many previous studies, our estimates of the number of patients who had any abnormal findings was 54% (95% CI: 53–64%),[17,18] and our estimates of those who would have a change in the surgical approach fell around 25%.[5,6,19] Additionally, the prevalence of *H. pylori* in our cohort was close to previous estimates in Saudi studies although we tried to minimize sampling/selection bias by enrolling patients regardless of their symptoms. Having said that, however, the high prevalence of *H. pylori* in our sample did not correlate to a higher number of abnormal EGD studies as we originally hypothesized.

With regard to symptoms, unlike many other authors, we found a statistically significant association of GERD and sleep apnea symptoms with EGD findings. The body of literature that supports this particular association has been growing over the past few years. For example,

AbdEllatif *et al*. studied a series of 3,219 patients at four different centers and compared those who had upper GI symptoms (group A) to those who did not (group B).[6] In their study, the difference between the two groups in terms of EGD findings was statistically significant (19% group A vs. 6% group B, $P = 0.001$). Similarly, a team from Mayo clinic (Gómez *et al*.) found the same association between age, GERD symptoms, and the occurrence of EGD abnormalities.[11] Gómez *et al*., nevertheless, took it a step further and attempted to build a score using these two variables to risk-stratify patients for abnormal findings on screening endoscopy. However, their score was only moderately effective in identifying patients who had the highest risk of clinically relevant EGD abnormalities.

With the cost, invasiveness, all the risks of sedation, and the potential to initiate unnecessary workup owing to irrelevant findings on screening EGD, many people advocate against the procedure with asymptomatic patients.[13,19-21] With the evidence, we presented above about the association between symptoms and plan-changing endoscopic findings, the idea of developing a clinical prediction score seems an efficient way to address all these issues. However, for such a clinical prediction rule to be effective in identifying high-risk patients, multiple questions need to be answered. First, endoscopists and bariatric surgeons need a consensus definition of what constitutes a "plan-changing" endoscopic finding. For example, a recent systematic review on 12,261 patients found that EGD only changed the surgical plan for 7.8% of cases. However, after they eliminated benign findings that had a controversial impact on management (e.g., hiatal hernia, gastritis, and peptic ulcer disease), that percentage dropped to 0.4%.[21] Once an agreed-upon definition of plan-changing EGD findings is stated, researchers can use the risk factors and symptoms of these findings to design a clinical prediction rule derivation study. Once derived, clinical researchers would be required to validate it in a broad spectrum of patients. Finally, one should keep in mind that eliminating EGD from the preoperative assessment of bariatric patients does not necessarily equate to better patient outcomes or cost reduction. For example, if eliminating EGD would mandate ordering other alternative tests to ensure optimal care (e.g., barium studies for esophageal abnormalities, urea breath test for *H. pylori*, etc.), the eventual impact of using a clinical/symptom-based tool instead of EGD might not be remarkable to patients nor cost-effective to healthcare systems.

In conclusion, EGD can identify a variety of pathological abnormalities before bariatric surgery, and up to 25% of them can affect the surgical approach or delay/cancel the surgery. GERD and sleep apnea symptoms can be strong predictors of EGD abnormalities. Despite that correlation, a few issues need to be resolved before safely recommending to move on from using EGD as a routine investigation in the preoperative assessment of bariatric patients. These issues include reaching an agreement on which EGD findings are plan-changing, deriving a clinical prediction score with high sensitivity and negative predictive value, validating it, and putting it through impact analysis to decide its ultimate benefit to patients and healthcare systems.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. DeNicola E, Aburizaiza O, Siddique A, Khwaja H, Carpenter DO. Obesity and public health in the Kingdom of Saudi Arabia. Rev Environ Health 2015;30:191-205.
2. GHO | By category | Prevalence of obesity among adults, BMI ≥ 30, crude-Estimates by country. Available at apps.who.int. Last update 2017.
3. Ryan D. Nonsurgical weight loss for extreme obesity in primary care settings. Arch Intern Med 2010;170:146-54.
4. Clinical Practice Guidelines for the Support of the Bariatric Surgery Patient | ASMBS. American Society for Metabolic and Bariatric Surgery. 2018.
5. Sharaf R, Weinshel E, Bini E. Endoscopy plays an important preoperative role in bariatric surgery. Obes Surg 2004;14:1367-72.
6. AbdEllatif ME, Alfalah H, Asker WA, El Nakeeb AE, Magdy A, Thabet W, *et al*. Place of upper endoscopy before and after bariatric surgery: A multicenter experience with 3219 patients. World J Gastrointest Endosc 2016;8:409-17.
7. Telmesani AM. *Helicobacter pylori*: Prevalence and relationship with abdominal pain in school children in Makkah City, western Saudi Arabia. Saudi J Gastroenterol 2009;15:100-3.
8. Hasosah M, Satti M, Shehzad A, Alsahafi A, Sukkar G, Alzaben A, *et al*. Prevalence and risk factors of *Helicobacter pylori* infection in Saudi children: A three-year prospective controlled study. Helicobacter 2014;20:56-63.
9. Akeel M, Elmakki E, Shehata A. Prevalence and factors associated with H. pylori infection in Saudi patients with dyspepsia. Electron Physician 2018;10:7279-86.
10. Al-Akwaa AM. Prevalence of *Helicobacter pylori* infection in a group of morbidly obese Saudi patients undergoing bariatric surgery: A preliminary report. Saudi J Gastroenterol 2010;16:264-7.
11. Gómez V, Bhalla R, Heckman M. Routine screening endoscopy before bariatric surgery: Is it necessary? Bariatr Surg Pract Patient Care 2014;9:143-9.
12. Badillo R, Francis D. Diagnosis and treatment of gastroesophageal reflux disease. World J Gastrointest Pharmacol Ther 2014;5:105-12.
13. Semelka M, Wilson J, Floyd R. Diagnosis and treatment of obstructive sleep apnea in adults. Am Fam Physician 2016;94:355-60.
14. Hartin C, ReMine D, Lucktong T. Preoperative bariatric screening and treatment of *Helicobacter pylori*. Surg Endosc 2009;23:2531-4.
15. Schirmer B, Erenoglu C, Miller A. Flexible endoscopy in the management of patients undergoing Roux-en-Y gastric bypass. Obes

Surg 2002;12:634-8.
16. De Palma GD, Forestieri P. Role of endoscopy in the bariatric surgery of patients. World J Gastroenterol 2014;20:7777-84.
17. Wolter S, Duprée A, Miro J. Upper gastrointestinal endoscopy prior to bariatric surgery-mandatory or expendable? An analysis of 801 cases. Obes Surg 2017;27:1938-43.
18. Loewen M, Giovanni J, Barba C. Screening endoscopy before bariatric surgery: A series of 448 patients. Surg Obes Relat Dis 2008;4:709-12.
19. Peromaa-Haavisto P, Victorzon M. Is routine preoperative upper GI endoscopy needed prior to gastric bypass? Obes Surg 2013;23:736-9.
20. Parikh M, Liu J, Vieira D, Tzimas D, Horwitz D, Antony A, *et al*. Preoperative endoscopy prior to bariatric surgery: A systematic review and meta-analysis of the literature. Obes Surg 2016;26:2961-6.
21. Bennett S, Gostimir M, Shorr R. The role of routine preoperative upper endoscopy in bariatric surgery: A systematic review and meta-analysis. Surg Obes Relat Dis 2016;12:1116-25.