

Literature Review Article

Manifestations of orofacial dysphagia after bariatric surgery: a systematic review

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obesity; bariatric surgery; weight loss; gastrectomy; dysphagia.

Abstract

Introduction: Obesity is a chronic condition characterized by the excessive accumulation of body fat, which can impact health. After bariatric surgery, it is essential to monitor and address any potential changes in dysphagia and swallowing in patients through pre- and post-operative speech therapy follow-up. **Objective:** This systematic review aims to assess whether there is an association between undergoing bariatric surgery and the development of dysphagia in the postoperative period. **Material and methods:** A comprehensive search was conducted in the PubMed/Medline, Web of Science, Lilacs, Embase, Livivo, and Scopus databases, as well as in gray literature through ProQuest, Google Scholar, consultations with specialists in the field, and citation searching. **Results:** After searching the databases, 2785 references were retrieved, and 12 articles were selected for synthesis. The incidence of dysphagia and deterioration of postoperative swallowing were analyzed. **Conclusion:** The collected data suggest that the incidence of dysphagia and the deterioration of swallowing function are not significantly elevated in patients who undergo bariatric surgery. These findings indicate that, in general terms, bariatric surgery does not imply an increased risk of complications related to swallowing.

Introduction

Obesity is globally recognized as a non-communicable pandemic, characterized by the pathological accumulation of adipose tissue, resulting in serious impacts on human health [17]. According to the World Health Organization [15] the diagnosis of obesity is based on the Body Mass Index (BMI), which is an essential tool for assessing overweight and its potential health risks. This clinical condition is closely linked to the development of severe comorbidities such as dyslipidemias, cardiovascular diseases, type 2 diabetes mellitus, stroke, atherosclerosis, and certain types of cancer. These associations highlight the importance of effective therapeutic approaches [15, 17].

Among the various intervention options to treat obesity, bariatric surgery (BS) stands out for its effectiveness in reducing weight and even in the remission of associated comorbidities [24]. Since its introduction in the United States in the 1950s, BS has evolved from procedures such as gastric bypass and gastroplasties to minimally invasive techniques like vertical gastrectomy (Sleeve technique), becoming a common practice in the treatment of morbid obesity [13].

In this context, uncertainties arise about the possible postoperative complications of bariatric surgery (BS), especially concerning changes in swallowing or the development of dysphagia [7, 8]. This disorder, characterized by difficulties in the passage of solid or liquid foods from the mouth to the stomach, can significantly impact the patients' quality of life, necessitating specific speech therapy interventions. Both obesity and bariatric surgery are considered risk factors for symptoms in the upper gastrointestinal tract, including dysphagia, which is frequently observed after surgery [1, 11].

Therefore, this study aims to investigate, through a systematic literature review, the following research question: "Is there an association between undergoing bariatric surgery and the development of dysphagia in the postoperative period?". This question is based on the need to understand the consequences of BS on swallowing function, aiming to optimize the care and rehabilitation of these individuals, ensuring a safe and effective recovery.

Material and methods

Protocol registration

This systematic review was developed in accordance with the Preferred Reporting Items for

Systematic Reviews and Meta-Analyses (Prisma) checklist [16], and its protocol was registered in the International Prospective Register of Systematic Reviews (prospero) under registration number CRD42023440182.

Eligibility criteria

The acronym "PICOS" was used to determine the eligibility of studies included in this review:

- Population (P) – Adult patients with obesity, of both sexes;
- Intervention (I) – Bariatric surgery;
- Comparison (C) – Pre- and postoperative periods;
- Outcome (O) – Presence of dysphagia in patients post-bariatric surgery;
- Study Design (S) – Randomized clinical trials, case-control studies, prospective and retrospective studies, observational studies, longitudinal studies, and cohort studies.

Inclusion criteria

Studies that assessed the presence of dysphagia in adult patients following bariatric surgery were included, with no restrictions regarding language, technique, country, or publication date. Randomized clinical trials, case-control studies, prospective and retrospective studies, observational studies, cross-sectional and longitudinal studies, as well as cohort studies, were selected.

Exclusion criteria

1. Studies that did not evaluate the pre- and post-surgery relationship between patients undergoing bariatric surgery;
2. Studies in which bariatric surgery was not performed as the intervention, or when it was associated with another type of surgery;
3. Reviews, expert opinions, in vitro or animal studies, letters, conference abstracts, case reports, and case series were excluded.

Search strategy

Appropriate word combinations and truncations were adapted in the following electronic databases, selected as sources of information: PubMed/Medline, Embase, Latin American and Caribbean Health Sciences Literature (Lilacs), Livivo, Web of Science, and Scopus. Grey literature was also used as a source of information through Google Scholar and ProQuest (Appendix 1). All searches were conducted in June 2023 and updated in March 2024.

References were managed using appropriate software (EndNote® X7 Thomson Reuters, Philadelphia, PA), and all duplicates were excluded. In addition to searches in electronic databases and grey literature, an expert who did not participate in the reading process was also consulted via email to provide their opinion on any publication on the topic and indicate relevant articles that could be included.

Study selection process

In Phase 1, two reviewers (A.X.F. and J.S.G.) independently read the titles and abstracts of all citations collected from the identified electronic databases. Articles that did not meet the inclusion criteria were discarded. In Phase 2, the same reviewers (A.X.F. and J.S.G.), also independently, applied the eligibility criteria to the full text of the articles. Whenever there were disagreements and a lack of consensus persisted even after discussion, a third reviewer (M.R.) was involved in the final decision. To ensure greater standardization in the article selection process by the reviewers, the Kappa coefficient was calculated through a preliminary literature search. The reading in Phase 1 only began after obtaining a Kappa coefficient greater than 0.8. To facilitate independent reading in both phases, the Rayyan website (<http://rayyan.qcri.org>) was used, which blinded the reviewers from all assessments, and a third team member (M.R.) acted as a moderator. For reference reading collection, Citation Chaser was used [9].

Data collection process and data items

Two authors (A.X.F. and J.S.G.) were responsible for collecting information from the articles included in the study, and this information was subsequently discussed between the two. The collected information included: study characteristics such as author, year of publication, country, and study design; characteristics of the study population, including total number of participants, total sample, number of cases and controls, gender, and age; types of surgeries performed; complaints related to dysphagia; as well as the results and conclusions of the studies. Any discrepancies were resolved through discussion and mutual agreement between the reviewers. In situations where consensus could not be reached, a third reviewer (M.R.) was consulted to make the final decision.

Data items

Mean and standard deviation values of the outcomes of interest were extracted from the included

studies. In the absence of these values, methods of mathematical approximation were used to estimate these data through the median and interquartile range, when available [23]. Values extracted from the studies were only accepted if obtained through validated questionnaires or clinical measurements. The sample size at each assessment time was also extracted from the included articles.

Risk of bias assessment

The risk of bias was assessed separately by three reviewers (A.X.F., J.S.G., and M.R.) using the Joanna Briggs Institute's critical appraisal checklist for cross-sectional and cohort studies [10]. The included articles were judged to have "high risk", "moderate risk", and "low risk" of bias when domains with "yes" responses represented 0-49%, 50-69%, and 70% or more, respectively [22]. A consensus meeting among the reviewers was convened to resolve any discrepancies. The checklist for cross-sectional studies was applied, as well as for cohort studies. The RevMan 5.4 software (Review Manager 5.4; The Cochrane Collaboration) was used to generate the numbers.

Results

Study selection

A total of 4,129 references were retrieved by the search strategy across the six electronic databases, resulting in 2,785 references after removing duplicate references. After the title and abstract screening (phase 1), a total of 98 articles were selected for full-text reading (phase 2), of which 87 were excluded (Appendix 2), resulting in a final inclusion of 11 articles for qualitative synthesis (figure 1). One additional article was included from the reference list (Citation Chaser) [9] and grey literature, totaling 12 articles included for review [2-6, 11, 12, 14, 17, 19].

Characteristics of the studies

The studies included in this analysis come from various countries: the United States with six studies [2, 5, 6, 12, 14, 18], followed by Brazil [17], and Australia [3, 4, 11] with two studies each, and France [3] and Greece [20] with one study each, demonstrating the breadth of research related to the consequences of bariatric surgery on swallowing. There were eight cross-sectional studies [3, 6, 12, 17, 19] and four cohort studies [2, 4, 5, 18]. The publication year ranged from 2003 to 2023. There

was a higher prevalence of females (81.36%) in the studies. All characteristics of the included studies can be viewed in table I.

Of the twelve included articles, a total of 1,613 individuals underwent BS with a mean age ranging from 37 years [17], to 58 years and 9 months [6], including 1,319 females and 294 males, of which 186 presented dysphagia in the postoperative period.

Table I – Summary of descriptive characteristics of included articles (n=12 8 cohort and 4 cross-sectional studies)

Author, year, country	Sample size and type of surgery	Dysphagia and main complaints	Results	Conclusion
Ballem <i>et al.</i> (2009) [2] – USA	N = 763 Means = 40,8 years 635 women; 128 men Roux-en-Y Gastric Bypass (RYGB)	Regarding dysphagia symptoms, the preoperative mean score was 13.2 ± 0.8 , indicating mild to no difficulty swallowing. Postoperatively, the mean score for dysphagia improved significantly to 5.5 ± 0.6 in the first year. However, by the second year, the mean values had increased to levels greater than the preoperative levels but were not statistically significant. The study's focus was on the change in symptom severity scores rather than the number of patients with the symptom. Main complaints: difficulty swallowing, heartburn, acid regurgitation.	The classification of preoperative symptoms was as follows: abdominal pain, 24.3 ± 0.7 ; heartburn, 41.0 ± 0.8 ; acid regurgitation, 30.9 ± 0.9 ; gnawing epigastric sensation, 26.5 ± 0.9 ; nausea/vomiting, 18.8 ± 0.7 ; borborygmus, 26.2 ± 0.8 ; abdominal distension, 30.3 ± 0.9 ; belching, 28.0 ± 0.8 ; increased flatulence, 38.9 ± 0.8 ; decreased bowel movement, 14.8 ± 0.8 ; increased bowel movement, 16.4 ± 0.7 ; loose stools, 22.1 ± 0.8 ; hard stools, 20.5 ± 0.9 ; urgent need to defecate, 23.2 ± 0.8 ; incomplete evacuation, 22.2 ± 0.8 ; difficulty falling asleep, 42.0 ± 1.1 ; insomnia, 38.4 ± 1 ; feeling rested, 60.1 ± 1 ; and difficulty swallowing, 13.5 ± 0.67 . At 1, 2, 3, 4, and 5 years after BGYR, 99.5%, 84.2%, 68.4%, 57.9%, and 47.4% of these symptoms improved significantly ($P < 0.05$).	Laparoscopic Roux-en-Y gastric bypass (LRYGB) significantly improves gastrointestinal symptoms experienced by morbidly obese patients without adversely affecting any of the measured parameters. This improvement in symptoms has been proven to be long-lasting over the long term.

To be continued...

Continuation of table I

Author, year, country	Sample size and type of surgery	Dysphagia and main complaints	Results	Conclusion
Carandina <i>et al.</i> (2021) [3] – France	N = 28 Means = 40 years 25 women; 3 men Sleeve	The study involved a total of 28 patients who underwent the Nissen-Sleeve (NS) procedure. Regarding symptoms of dysphagia, it is not explicitly stated how many patients had symptoms of dysphagia before the surgery. However, postoperatively, three patients (10.7%) experienced transient postoperative dysphagia, and in one case, it persisted for 4 months. Additionally, two reinterventions (7.1%) were performed due to complications, one of which was for severe dysphagia confirmed by upper gastrointestinal swallow. Main complaints: nausea, vomiting, regurgitation, upward flow of gastric fluid into the mouth when lying down, and continuous dry cough, hoarseness, and throat pain.	A total of 28 N-sleeve procedures were performed during the considered period. All patients had hiatal hernia, which was evaluated to be between 2 and 6 cm in length preoperatively. Stage A esophagitis, according to the Los Angeles classification, was detected in 71% of the patients, while 8 out of 28 patients had stage B esophagitis. One patient had a preoperative diagnosis of Barrett's esophagus. Complete disappearance of gastroesophageal reflux disease (GERD) symptoms was achieved in 25 out of 28 patients, while the remaining patients reported symptom improvement and continued to be treated with low doses of proton pump inhibitors. Two reinterventions (7.1%) (Clavien-Dindo IIIb) were performed. Additionally, three patients (10.7%) experienced transient postoperative dysphagia, which persisted for 4 months in one case (Clavien-Dindo II). All patients were treated with conservative management, and endoscopic dilation was performed in each case.	The Nissen Sleeve appears to be a safe surgical technique with an acceptable rate of early postoperative complications. NS seems to be effective in treating patients suffering from obesity and preoperative reflux, but data are insufficient to establish whether it can reduce the long-term risk of recurrent GERD in patients with laparoscopic vertical gastrectomy.

To be continued...

Continuation of table I

Author, year, country	Sample size and type of surgery	Dysphagia and main complaints	Results	Conclusion
Chern <i>et al.</i> (2021) [4] – Australia	N = 31 Means = 45,7 years 20 women; 11 men Laparoscopic Vertical Gastrectomy (LSG)	The study involved 31 patients who underwent sleeve gastrectomy (SG). Regarding symptoms of dysphagia, the study reported an increase in failed swallows from 3.1% to 7.5% postoperatively, which could indicate a symptom of dysphagia. However, the study does not provide specific numbers of patients who had symptoms of dysphagia before and after the surgery. It focuses on the objective measures of esophageal function rather than subjective symptoms. Main complaints: swallowing difficulties	A total of 31 patients underwent GV, with 20 undergoing synchronous hiatal repair and fixation and 6 being excluded. HRM demonstrated significantly increased intragastric pressures (15.5-29.6 mm Hg) and swallowing failures (3.1-7.5%), but no other alterations in esophageal motility. MII-pH did not show significant changes in acid exposure time (8.5%-7.5%) or the number of reflux episodes, although the number of long reflux episodes (2.3-4.7) and weakly acidic reflux episodes significantly increased (15.4-55.2). DeMeester and GSAS scores were not significantly altered. There was no significant difference in patients with pre-existing reflux. However, for patients without pre-existing reflux, acid exposure time significantly increased (1.3%-6.7%), as did DeMeester scores (5.8-24.5) and the number of long reflux episodes (0.1-4.4) and weakly acidic episodes (22.1-89.2).	Vertical gastrectomy was associated with increased intragastric pressures, without alterations in esophageal motility or acid exposure. For patients without preexisting reflux, there was an increase in acid exposure time, long reflux episodes, weakly acidic reflux episodes, and DeMeester score.

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Author, year, country	Sample size and type of surgery	Dysphagia and main complaints	Results	Conclusion
Clements <i>et al.</i> (2003) [5] – USA	N = 43 Means = 37,3 years 40 women; 3 men Laparoscopic Roux-en-Y Gastric Bypass (LRYGB)	The study involved 43 patients who completed the gastrointestinal symptom questionnaire preoperatively. Regarding dysphagia, the study found that it was equivalent to control subjects preoperatively but increased significantly after laparoscopic Roux-en-Y gastric bypass (LRYGBP). Specifically, 36 patients completed the questionnaire 6 months postoperatively, indicating a response rate of 84%. Dysphagia scores were not significantly different preoperatively compared to controls, but postoperative dysphagia was worse when compared to controls. Main complaints: dysphagia alone.	Abdominal pain, IBS, reflux, GERD, and sleep disturbance symptoms were significantly worse preoperatively compared to controls. Dysphagia did not differ. Postoperative versus preoperative scores revealed that symptoms of abdominal pain, IBS, GERD, reflux, and sleep disturbances significantly improved. Only dysphagia was worse when comparing postoperative to controls. No other symptoms. The tom cluster was significantly different in controls versus postoperative.	Patients with morbid obesity exhibit more intense gastrointestinal symptoms than control individuals, and many of these symptoms return to control levels 6 months after LRYGBP. Dysphagia is equivalent to that of control individuals preoperatively but increases significantly after LRYGBP. These data suggest another improvement in quality of life (relief of gastrointestinal symptoms) for patients with morbid obesity. Further follow-up is needed to document the long-term reduction of gastrointestinal symptoms.
Dalal <i>et al.</i> (2022) [6] – USA	N = 120 Means = 58,9 years 98 women; 21 men Laparoscopic Vertical Gastrectomy (LSG) or Laparoscopic Roux-en-Y Gastric Bypass (LRYGB)	The study included 20 patients who underwent high-resolution esophageal manometry (HRM) prior to bariatric surgery and 100 control patients who did not undergo HRM. Regarding symptoms of dysphagia: Preoperative	Compared to controls, patients undergoing preoperative GRH had a higher rate of postoperative chronic intolerance (25% versus 8%, $P = 0.041$). This difference was not observed in propensity score matching analysis. Identification of	Preoperative abnormalities have been associated with postoperative symptoms in patients undergoing bariatric surgery. HRM can identify patients more likely to experience

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Continuation of table I

Author, year, country	Sample size and type of surgery	Dysphagia and main complaints	Results	Conclusion
		Dysphagia: Among the HRM group, 25% (5 out of 20 patients) reported preoperative dysphagia. Postoperative Dysphagia: In the acute postoperative period, 15% of the HRM group experienced dysphagia compared to 2% of the control group. In the chronic postoperative period, both groups had a 10% incidence of dysphagia. Main complaints: Reflux, heartburn, dysphagia, nausea, and vomiting.	elevated integrated relaxation pressure and obstruction at the esophagogastric junction exit predicted chronic intolerance (odds ratio = 21.0; 95% confidence interval: 1.40–314; P = 0.027 for each).	postoperative esophageal symptoms and may assist in discussions regarding suitability for surgery and selection of bariatric intervention.
Jarraf and Devadas (2018) [11] – Australia	N = 124 Means = 40,9 years 93 women; 31 men Laparoscopic Vertical Gastrectomy (LSG)	No patients reported dysphagia preoperatively. The median scores on the DHI scale were as follows: physical – 2 (0-20); functional – 4 (0-22); emotional – 2 (0-14); and esophageal – 2 (0-8). In multivariate analysis, emotional scores on the DHI significantly correlated with reduction in total weight loss (%TWL) (p = 0.001) and excess weight loss (%EWL) (p = 0.023). Physical symptoms of dysphagia did not affect weight outcomes. Postoperatively, the use of PPI significantly increased (15.8 vs 19.8%, p = 0.01) and correlated with higher dysphagia scores.	A specific dysphagia questionnaire, statistically validated, was used to assess the impact of LSG on dysphagia, including its functional and emotional influences. The psychosocial disadvantage of dysphagia significantly reduced weight loss outcomes. A correlation was found between PPI use and dysphagia after LSG.	The study highlights the importance of further research to understand the prevalence of dysphagia after LSG and the factors contributing to its symptoms.

To be continued...

Continuation of table I

Author, year, country	Sample size and type of surgery	Dysphagia and main complaints	Results	Conclusion
Kalarchian <i>et al.</i> (2017) [12] – USA	N = 183 Means = 46 years 152 women; 31 men Roux-en-Y Gastric Bypass (RYGB) or Laparoscopic Adjustable Gastric Banding (LAGB)	Regarding dysphagia symptoms, the study reported 183 patients: Prevalence of dysphagia at least once weekly decreased post-laparoscopic adjustable gastric band surgery from 43.9% in year 1 to 27.5% in year 3; dysphagia at least once weekly also appeared to decrease in years 1-3 post-Roux-en-Y gastric bypass, from 16.7% to 10.9%. The study does not provide specific numbers for patients with symptoms of dysphagia before the surgery, only the prevalence rates after the surgery are given. Dysphagia: The prevalence of dysphagia, or difficulty swallowing, appeared to decrease over the three years following both Roux-en-Y gastric bypass (RYGB) and laparoscopic adjustable gastric band (LAGB) surgeries.	The prevalence of dysphagia at least once a week decreased post-laparoscopic adjustable gastric banding from 43.9% (95% confidence interval [CI], 32.2-55.6) in year 1 to 27.5% (95% CI, 15.2-39.9) in year 3 (P = 0.02). Dysphagia and dumping at least once a week also appeared to decrease in years 1-3 after Roux-en-Y gastric bypass (i.e., from 16.7% [95% CI, 9.4-24.1] to 10.9% [95% CI, 4.0-17.8] and from 9.9% [95% CI, 4.3-15.5] to 6.3% [95% CI, 1.7-10.9], respectively), but power was limited to assess trends. Vomiting at least once a week was rare (<6%) in years 1-3 after both procedures. Controlling for potential confounders and surgical procedure, loss of eating control at least once a week was associated with a higher risk of dysphagia at least once a week (relative risk = 2.01, 95% CI, 1.36-2.99, P = 0.001).	The prevalence of gastrointestinal symptoms related to bariatric surgery appears to decrease over the course of follow-up. These symptoms have been associated with loss of food control, suggesting a target for clinical intervention.

To be continued...

Continuation of table I

Author, year, country	Sample size and type of surgery	Dysphagia and main complaints	Results	Conclusion
Miller <i>et al.</i> (2020) [14] – USA	N = 137 Means = 48,9 years 118 women; 19 men Laparoscopic Vertical Gastrectomy (LSG)	The study identified a total of 137 patients who underwent high-resolution impedance manometry (HRIM). Out of these, 97 patients underwent HRIM after bariatric surgery, and 40 patients were preoperative bariatric surgery candidates. For symptom assessment via survey, 271 post-bariatric surgery patients were contacted, and the prevalence of dysphagia was found to be 13.7% at an average of 3.9 years after surgery. The study does not specify the exact number of patients with symptoms of dysphagia before the surgery. However, it mentions that among the postsurgical patients who underwent HRIM, a manometric pattern consistent with achalasia was identified in 7 (7.2%) postsurgical patients compared with none in the preoperative group. Additionally, an achalasia-like pattern defined by aperistalsis and increased intragastric pressure (POSED) was found in 5 (5.2%) postsurgical patients versus none preoperatively. Main complaints: achalasia.	The dysphagia rate averaged 13.7% 3.9 years after surgery. Among 271 post-bariatric surgery patients contacted for symptom evaluation through a survey, the prevalence.	Post-operative dysphagia is a common long-term complication of bariatric surgery. This is potentially due to dysmotility, particularly achalasia and POSED. Consequently, esophageal dysmotility may be a time-dependent association with the development of post-operative esophageal issues.

To be continued...

Continuation of table 1

Author, year, country	Sample size and type of surgery	Dysphagia and main complaints	Results	Conclusion
Parreira <i>et al.</i> (2020) [17] – Brazil	N = 19 Means = 37 years 15 women; 4 men Laparoscopic Roux-en-Y Gastric Bypass (LRYGB)	Before surgery: two patients reported food sticking in their pharynx, and eight patients experienced heartburn. These symptoms suggest difficulties in swallowing or dysphagia. After surgery: the study found that postoperative patients had more food intolerance and a higher sensation of food sticking in the esophagus, which may indicate an increased prevalence of dysphagia after surgery. Main complaints: food sticking in pharynx; heartburn.	With liquid bolus swallowing, obese individuals exhibited higher frequency of premature posterior spillage before and after surgery. Before surgery, obese individuals showed greater pharyngeal clearance of liquid compared to the control group and individuals after surgery. After surgery, obese individuals exhibited longer duration of hyoid movement with liquid and paste bolus compared to before surgery. Additionally, there was a reduction in the interval between bolus entry into the pharynx and the onset of hyoid upward excursion.	Obese non-operated patients exhibited higher pharyngeal clearance for liquid bolus compared to healthy controls.
Ribieras <i>et al.</i> (2023) [18] – USA	N = 100 Means = 42 years 72 women; 28 men Laparoscopic Vertical Gastrectomy (LSG)	The study involved 100 patients who were enrolled between November 2019 and June 2020 to assess the correlation between preoperative symptoms of reflux and dysphagia, UGI series findings, and the intraoperative diagnosis of hiatal hernia. Regarding the symptoms of dysphagia before the surgery, the study utilized the Brief Esophageal Dysphagia Questionnaire (BEDQ), but it does not provide specific numbers for patients with symptoms of dysphagia before the surgery. The results indicated that most patients, including	Contrary to this, the majority of patients, including those with anterior hiatal hernia, did not report significant dysphagia symptoms. Only 2 patients (2.9%) scored a 10.	Hiatal hernias are highly prevalent in GE patients. However, GerdQ, BEDQ, and an UGI series unreliably identify hiatal hernias in the preoperative setting and should not influence intraoperative evaluation of the hiatus during GV.

To be continued...

Continuation of table I

Author, year, country	Sample size and type of surgery	Dysphagia and main complaints	Results	Conclusion
		those with hiatal hernia, reported no significant dysphagia symptoms on the BEDQ. Postoperative symptoms are not discussed in the provided context.		
		Main complaints: reflux, dysphagia.		
Sales and Mourão (2020) [19] – Brazil	47 patients: 42 females, 5 males, average age of 39.5 years. Not specified	The study included 47 individuals who were candidates for bariatric surgery. Regarding symptoms of dysphagia, the paper does not provide specific numbers for patients with dysphagia symptoms before the surgery. However, it mentions that in the second- and third-month post-surgery, the most common complaint was difficulty with rice, reported by 27% and 30% of participants, respectively. They described a sensation of bolus, which negatively impacted swallowing. There is no mention of dysphagia symptoms before the surgery in the provided context.	In the assessment of the complaint related to rice consumption, participants mentioned a “sensation of food bolus”, while others denied experiencing difficulties in chewing, swallowing, or adhering to the proposed diet. These individual differences appear to have no significant impact on swallowing. In the fourth month of postoperative follow-up, 2% reported complaints of non-accessibility to the bariatric surgery protocol.	Preoperative speech therapy for bariatric surgery showed a population with no evident elements, consequently impairing masticatory function. In the second and third postoperative months, the most recurring complaint is with rice, 27% and 30%, respectively, where participants report a sensation of bolus, impacting swallowing levels.
		Main complaints: bolus, difficult to eat rice.		

To be continued...

Continuation of table I

Author, year, country	Sample size and type of surgery	Dysphagia and main complaints	Results	Conclusion
Sioka <i>et al.</i> (2017) [20] – Greece	N = 18 Means = 40,7years 10 women; 8 men Laparoscopic Vertical Gastrectomy (LSG)	The study included 18 patients. Regarding symptoms of dysphagia before and after laparoscopic sleeve gastrectomy (LSG), it does not provide specific numbers for dysphagia. It mentions symptoms of heartburn and regurgitation, with heartburn improving in 38.9% of patients and regurgitation improving in 11.1% of patients post-operatively. However, it also notes that heartburn worsened in 11.1% and regurgitation worsened in 27.8% of patients after the surgery. For detailed numbers specifically related to dysphagia, the text does not offer explicit information. Main complaints: heartburn, regurgitation. Heartburn: Improved in 38.9% of patients, no change in 50%, and worsened in 11.1%. Regurgitation: Improved in 11.1% of patients, no change in 61.1%, and worsened in 27.8%.	Peristaltic swallowing movements significantly increased from 47.2 ± 36.8 to 82.8 ± 28 after gastrectomy.	Patients developed a decrease in the length and weakening of the pressure of the lower esophageal sphincter (LES) after LSG. The peristalsis of the esophageal body was also affected in terms of decreased amplitude pressures, especially at the upper edge of the LES. However, esophageal body peristalsis was normalized. LSG may not worsen heartburn. Regurgitation may increase after LSG due to the shortening of the LES length, particularly in patients with a preoperative amplitude pressure range at the upper.

Bias risk in the studies

Out of the 12 included studies, four were cohort observational studies [2, 4, 5, 18], and eight were cross-sectional studies [3, 6, 11, 12, 14, 17, 19, 20], ten studies were considered to be at “low risk” [4-6, 11, 12, 14, 17-20], and two were considered to be at high risk [2, 3].

Individual results of the studies

The results address different aspects of bariatric surgery and its effects on gastrointestinal symptoms, dysphagia, swallowing, and other symptoms, which are illustrated in figure 1 and figure 2.

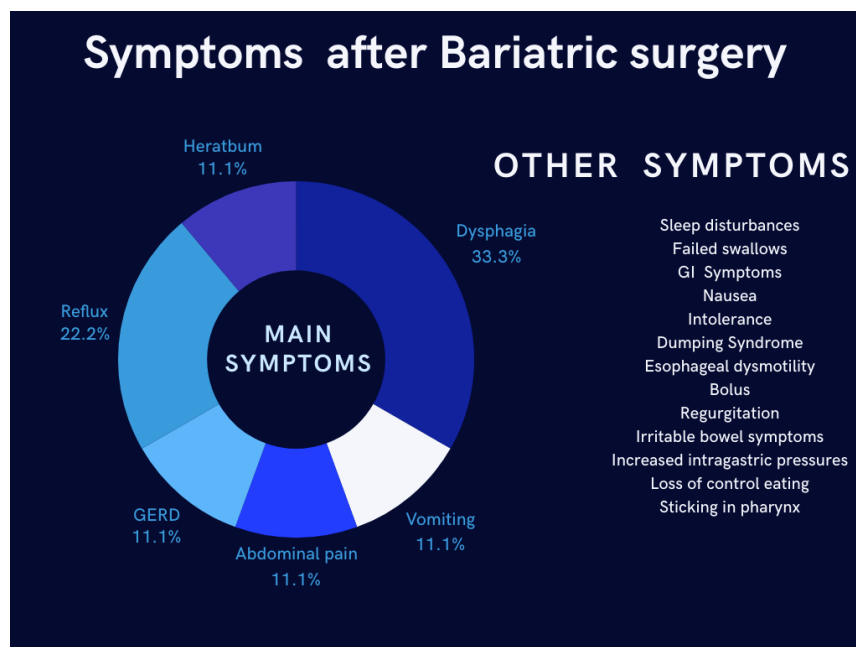
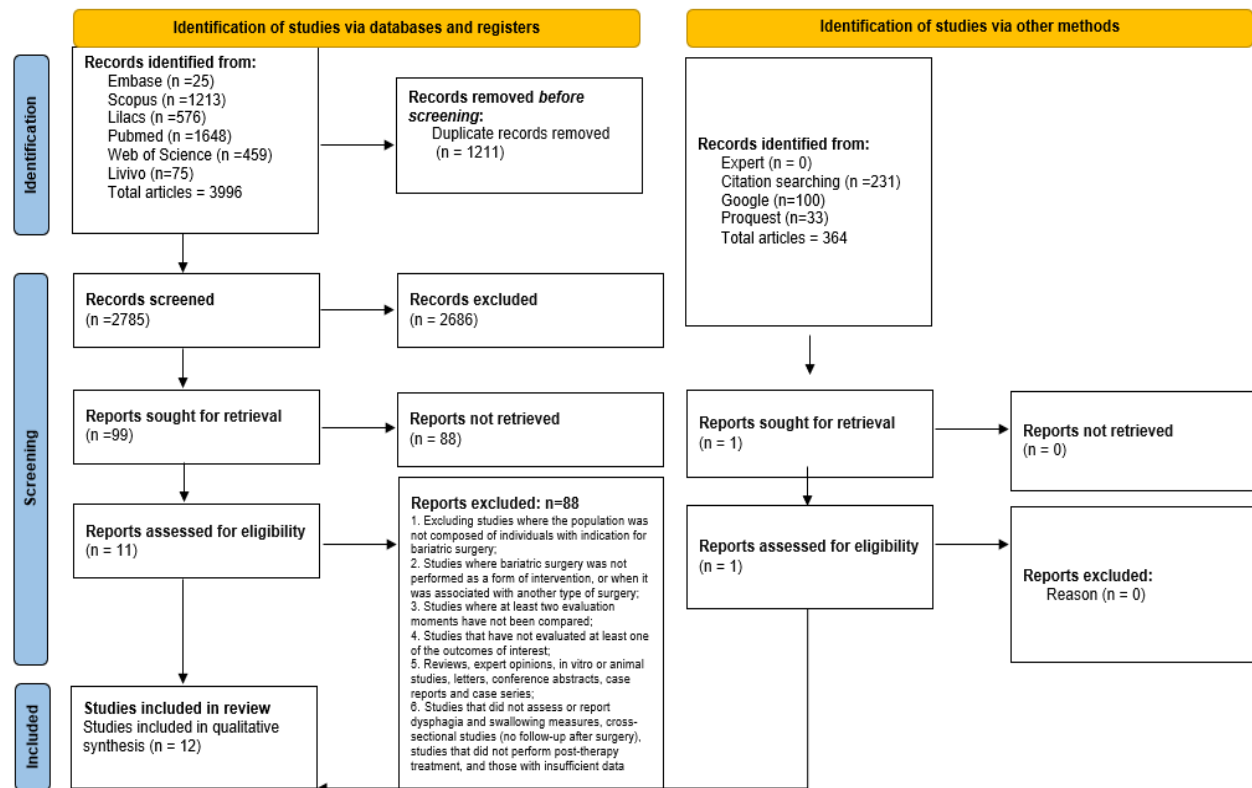


Figure 1 – Main symptoms after bariatric surgery

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers and other sources

**Figure 2** – Flowchart of literature search and study selection

From: [16]. For more information, visit: <http://www.prisma-statement.org/>

Dysphagia

Studies indicate significant improvements in 17 out of 19 gastrointestinal symptom-related questions in the first two years after bariatric surgery (BS) [2, 5] with the exception of dysphagia [5] and post-operative dysphagia [2]. Reflux showed continuous improvement over five years [2, 5].

Studies indicate that, regarding dysphagic aspects, there is a worsening of dysphagia in the postoperative period [2, 6, 11, 12]. However, a reduction in this condition over time was observed. Pre- and post-operative dysphagia were found to be equivalent in individuals evaluated together with a control group before surgery, but there was a worsening in the postoperative period when compared to the control group [5]. In a specific study, patients who did not report dysphagia preoperatively experienced a significant increase in this condition postoperatively [11]. Related to transient dysphagia, one study observed its occurrence postoperatively, with persistence for up to 4 months [3]. However, in another study, the majority of patients did not report significant dysphagia after surgery [18].

Swallowing

Regarding swallowing, it was observed that patients experienced worsening in the swallowing of solid foods post-surgery, presenting some symptoms such as vomiting documented after the three types of bariatric procedures, namely, gastric bypass, Roux-en-Y gastric bypass, and sleeve, nausea, pressure, spasm, and/or chest pain, symptoms that appear more during meals than preoperatively [17, 19]. Increased swallowing disorders [4] were also reported, but no penetration or aspiration of food into the airways was observed [17].

Abdominal pain

Only one study pointed to improvement in abdominal pain postoperatively [5]. Incidences of acute postoperative reflux/heartburn and epigastric pain were numerically higher [6]. In summary, these studies demonstrate that bariatric surgery can lead to significant improvements in reflux symptoms and gastrointestinal symptoms in patients with morbid obesity, but results may vary in terms of dysphagia and other symptoms. The choice of

surgical technique and individual patient evaluation play important roles in post-surgical outcomes. Additionally, long-term follow-up is crucial for fully understanding the effects of bariatric surgery on these conditions.

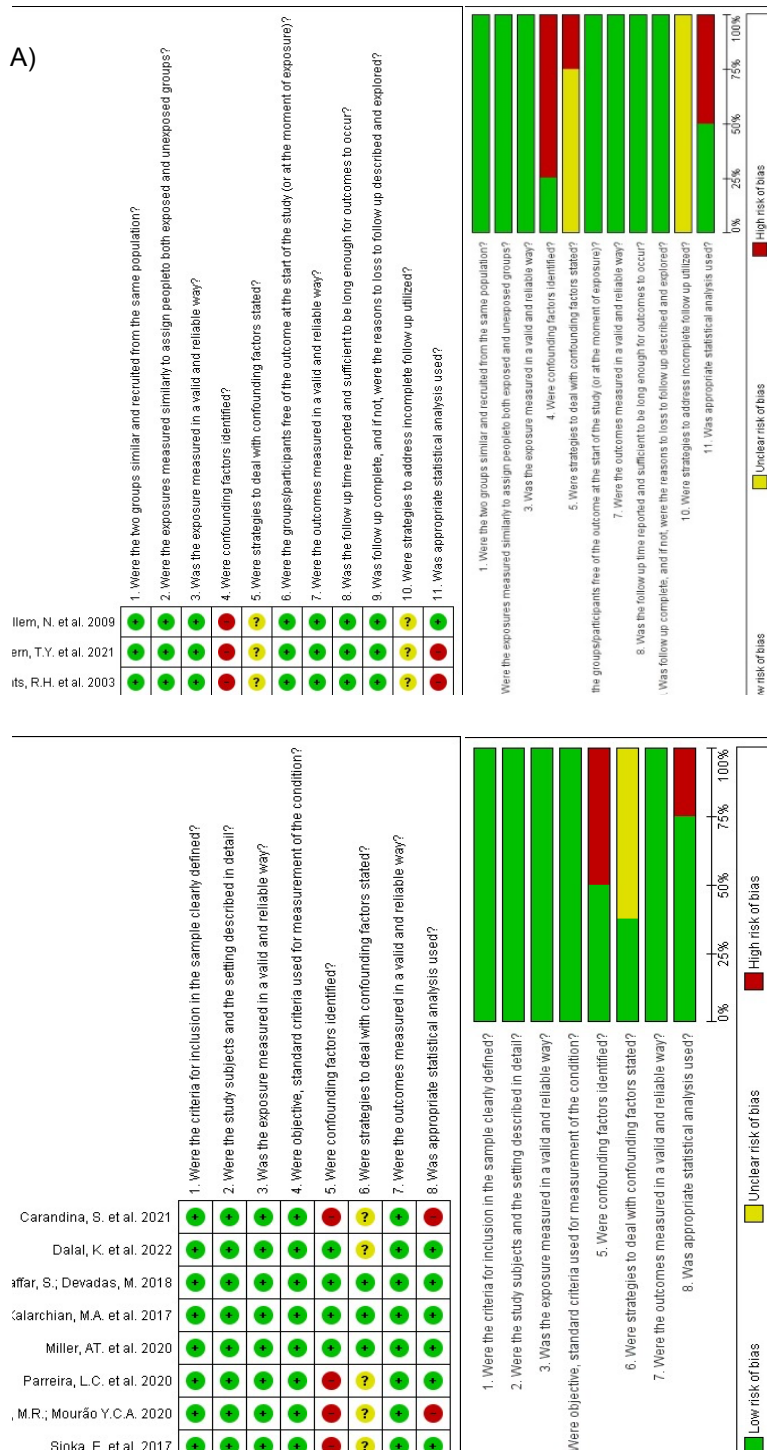


Figure 3 – Risk of bias assessment for studies included in the synthesis, evaluated by JBI’s Critical Appraisal Tools. Green indicates a low risk of bias, yellow indicates an uncertain risk of bias, and red indicates a high risk of bias: A) cohort studies; B) cross-sectional studies

The main complaints of bariatric patients after Roux-en-Y gastric bypass (RYGB) surgery include abdominal pain, irritable bowel symptoms, GERD and reflux, sleep disturbances, and dysphagia [2]. Abdominal pain showed the most significant improvement, especially “gnawing sensations in the epigastrium”, though borborygmus remained unchanged. Constipation became common postoperatively, contrary to the expectation of severe diarrhea. GERD and reflux improved significantly in the first year and remained better over five years. Sleep-related symptoms improved significantly in the first three years, and dysphagia improved in the first year, worsened in the second, and then decreased to below preoperative levels. These findings suggest RYGB effectively controls various gastrointestinal symptoms in morbidly obese patients [2].

Carandina *et al.* [3] said that the main complaints of bariatric patients after surgery are postoperative GERD symptomatology that was observed in a significant number of patients following Laparoscopic Sleeve Gastrectomy (LSG). And a small percentage of patients required reinterventions due to complications such as severe dysphagia and staple line leak. These findings highlight the importance of considering potential postoperative complications and the need for careful patient monitoring after bariatric surgery [3]. The results of Chern *et al.* [4] suggest that while sleeve gastrectomy is effective for weight loss, it may lead to an increase in GERD symptoms for some patients.

For Clements *et al.* [5] other gastrointestinal symptoms like abdominal pain, IBS, GERD, reflux, and sleep disturbances showed significant improvement postoperatively. It's important to note that while most GI symptoms improved and returned to control levels, dysphagia was the exception, worsening after the Laparoscopic Roux-en-Y Gastric Bypass (LRYGBP). Longer follow-up is suggested by the study to determine the long-term reduction of GI symptoms [5].

Dalal *et al.* [6] said that patients experienced a range of symptoms such as reflux, dysphagia, nausea/vomiting, bloating, fullness, early satiety, pain, and intolerance. A notable finding was a higher rate of postoperative chronic intolerance in patients who underwent preoperative high-resolution esophageal manometry (HRM), particularly those with elevated integrated relaxation pressure (IRP) and esophagogastric junction (EGJ) outflow obstruction. Preoperative HRM abnormalities were associated with postoperative esophageal symptoms,

suggesting that HRM could help predict persistent or postoperative esophageal symptoms [6].

Kalarchian *et al.* [12] called attention to symptoms associated with dumping syndrome, which occurs when food moves too quickly from the stomach to the small intestine, were also reported. The prevalence seemed to decrease over time post-surgery, particularly after RYGB. These symptoms were significant enough to be considered for clinical intervention, as they could impact the patients' quality of life and satisfaction with the surgery. The study suggests that these GI symptoms are a target for postoperative care to improve patient outcomes [12].

Miller *et al.* [14] affirmed that postoperative Dysphagia is a significant long-term complication with a prevalence of 13.7% at an average of 3.9 years after surgery. They also found esophageal dysmotility, including achalasia and postobesity surgery esophageal dysfunction (POSED), potentially due to a time-dependent. When compared with transient postoperative dysphagia [14], in the study by Carandina *et al.* [3], it persisted for 4 months [3]. However, in the study by Ribieras *et al.* [18], there was no manifestation of dysphagia after surgery in the majority of individuals. Furthermore, in the study by Kalarchian *et al.* [12] there was a decrease in worsening over the years.

Association with postoperative changes. These complications suggest that esophageal dysmotility may be an important, yet under-recognized, consequence of bariatric surgery. The study emphasizes the need for awareness and monitoring of these symptoms in post-bariatric surgery patients.

Discussion

The aim of this study was to investigate, through a systematic literature review, whether patients undergoing bariatric surgery are prone to developing dysphagia and swallowing difficulties in the postoperative period. By evaluating swallowing and signs of dysphagia in their qualitative aspect, this inquiry is grounded in the need to understand the repercussions of bariatric surgery on swallowing function, aiming to optimize the care and rehabilitation of these individuals, ensuring a safe and effective recovery.

Bariatric surgery encompasses techniques primarily aimed at weight reduction and disease regression. While there is an increase in patients' self-esteem after surgery, it is important to note that some psychological and physiological changes

may intensify post-bariatric surgery effects, which, in turn, may impact health conditions [24]. Most studies report that the incidence of dysphagia and deterioration of swallowing function are not significantly elevated in patients undergoing bariatric surgery [2-4, 6, 11, 12, 14, 17-19].

During different phases of swallowing, alterations may occur that disrupt the flow of the bolus, termed dysphagia. Some studies included in this review observed a worsening of dysphagia in the postoperative period [2, 6, 12].

Dysphagia is a swallowing disorder that affects the ability to transport food or liquids from the mouth to the stomach [4, 17]. Regarding pre- and post-operative dysphagia in the study by Clements *et al.* [5], the incidence of dysphagia was similar in individuals compared to the pre-control, but there was worsening in the postoperative group. On the other hand, some studies asserted that individuals did not report dysphagia preoperatively; however, there was a significant increase postoperatively [2, 3, 6, 11, 12].

After rapid chewing, the tongue moves to propel the bolus towards the pharynx. This initial phase is known as the oral phase of swallowing and is executed through voluntary contraction of the muscles of the face and oral cavity [21]. Some studies reported worsening swallowing of solid foods in post-surgery individuals, presenting symptoms such as nausea, vomiting, low pressure during meals [6, 17, 19].

Post-bariatric abdominal pain can be a common symptom [3, 12]. Thus, in the study by Clements *et al.* [5], it was observed that there was an improvement in abdominal pain postoperatively. Conversely, the opposite was observed in the study by Dalal *et al.* [6] where post-bariatric individuals, besides presenting dysphagia, some individuals also experienced acute epigastric pain postoperatively. Therefore, it is important to highlight that worsening of dysphagia symptoms may occur in bariatric patients. Multidisciplinary teams should act in these cases to prevent worsening or chronicity of these cases, increasing patient well-being in the postoperative period. Additionally, longitudinal follow-up of bariatric patients is important for early identification of cases where symptoms persist.

Some limitations of the present review should be highlighted, such as the short follow-up period of the included studies. Most studies analyzed in this review had a short-term follow-up of patients, which may compromise the robustness of the conclusions drawn. A longer follow-up period for

patients undergoing surgery could increase the reliability of the generated evidence, allowing these patients' bodies to reach a state of balance and response to the surgical impact. Based on what has been discussed in this review, it is possible to observe that, despite the numerous benefits that this procedure offers to patients, it is recommended that patients undergoing surgery receive thorough follow-up by physicians, speech therapists, and the entire multidisciplinary team, both before and after the surgical procedure, aiming for a significant improvement in the patient's quality of life and the reduction of the incidence of the various injuries mentioned earlier. The choice of surgical technique and the individual evaluation of the patient play important roles in post-surgical outcomes. Additionally, long-term follow-up is crucial for fully understanding the effects of bariatric surgery on these conditions. Prolonged follow-up would allow for a more comprehensive assessment of long-term outcomes, including potential late complications and the maintenance of benefits achieved after surgery.

Conclusion

There is a need for a multidisciplinary approach in monitoring patients undergoing bariatric surgery, emphasizing the importance of specific care for swallowing function. This includes the active participation of physicians, speech therapists, and other healthcare professionals to ensure a safe recovery and significantly improve the patient's quality of life. Most studies report that dysphagia and deterioration of swallowing function are not significantly elevated in patients undergoing bariatric surgery. These findings indicate that, overall, bariatric surgery may not imply an increased risk of swallowing-related complications. However, enhanced clinical surveillance regarding the onset or worsening of gastroesophageal reflux in the postoperative period is emphasized.

Additionally, longitudinal and larger-scale studies are recommended for a more comprehensive understanding of the long-term implications of bariatric surgery on swallowing function and the upper gastrointestinal tract. Thus, the coordination between a multidisciplinary approach and continuous monitoring is crucial to ensure a favorable clinical outcome and improvement in the quality of life of patients after bariatric surgery.

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