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# Safety and efficacy of Mini-Gastric Bypass surgery: A systematic review study

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## ABSTRACT

**Background:** Mini-gastric bypass (MGB) surgery is a successful and secure method for losing weight. It provides lasting weight loss with the possibility of revision or reversal. The procedure has potential benefits such as reduced surgery duration and enhanced patient contentment. Nevertheless, there are ongoing worries about its anatomical structure and metabolic consequences. **Objectives:** This systematic review aims to evaluate the safety and efficacy of MGB surgery. It assesses postoperative complications, adverse events, weight loss outcomes, and resolution of comorbidities. The review provides guidance for clinicians, researchers, and patients in their decision-making process. **Methods:** The study design followed the guidelines for meta-analyses of interventional studies. The researchers conducted a thorough investigation by exploring five scholarly databases, including PubMed, Scopus, Google scholar, and Web of Science. Their objective was to identify any published materials from the period of 2014 to 2023 available in each database. To accomplish this, they devised an all-encompassing search strategy utilizing MeSH keywords. Within the realm of their study, they utilized the phrases "Safety and Efficacy", "Mini-Gastric Bypass Surgery", "Clinical trials", and "observational" to further enrich their investigation. **Results:** 156 articles were collected, nine full-text studies included in the review. The included studies provide insights into the safety and efficacy of MGB surgery. Studies from different countries report positive outcomes related to resolution of comorbidities and weight loss. **Conclusion:** MGB surgery is a promising alternative for those considering bariatric surgery. More research and follow-up studies are necessary for concerns and standard of care establishment.

**Keywords:** Safety and Efficacy, Mini-Gastric Bypass Surgery, Clinical trials, observational

## 1. INTRODUCTION

Mini-gastric bypass (MGB) surgery is a safe and effective weight loss procedure that involves creating a pouch in the stomach and constructing a non-obstructing

gastrojejunostomy. Surgery can be modified based on the patient's BMI and offers long-lasting weight loss with the option of revision or reversal (Deitel and Rutledge, 2019). MGB surgery is known as one-anastomosis gastric bypass De-Luca et al., (2018) and single-anastomosis gastric bypass that offers potential advantages such as decreased operation time, simplified technique, and improved patient satisfaction. However, the establishment of this procedure as a standard of care is hindered by a lack of evidence and ongoing concerns regarding its anatomical configuration and metabolic implications (Aleman et al., 2020). The benefits of MGB include increased rates of remission of type 2 diabetes mellitus, excess weight loss, hypertension, and obstructive sleep apnea, along with decreased rates of osteoarthritis remission, leakage, overall late complications, and gastroesophageal reflux disease (Wang et al., 2017).

MGB is a secure and efficacious alternative for patients undergoing bariatric surgery. The procedure comprises an elongated, lesser-curvature gastric part with a gastroenterostomy placed 180 to 200 cm distal to duodenojejunal junction. Mason's loop gastric bypass has been compared to MGB, but with an extended lesser curvature tube. Nevertheless, the widespread acceptance of MGB is limited, and the procedure encounters its detractors. Concerns have been raised regarding the presence of symptomatic biliary reflux gastritis and esophagitis necessitating revision surgery, as well as the potential gastric esophageal cancer risk originating from chronic biliary reflux. The controversial character of the MGB has prompted a systematic assessment of the recorded knowledge regarding the process. the procedure (Mahawar et al., 2013). The primary objective of this systematic review is to evaluate the general safety and efficacy of MGB surgery and outcome.

## 2. METHOD

The study design adhered to the guidelines for meta-analyses of interventional studies outlined in "Preferred Reporting Items for Systematic Reviews and Meta-Analyses". The authors conducted a comprehensive search across scientific databases, including Scopus, PubMed, google scholar, and Web of Science, using MeSH keywords to create a thorough search strategy to locate published works from 2014 until 2023, specifically focusing on double-blinded, randomized controlled studies, MGB Surgery, and clinical trials.

The researchers also manually inspected the remaining bibliographies from the included studies, which were considered for references cited in other studies that were missed in the initial electronic search, and utilized Google Scholar for supplementary searches. A total of 151 papers were initially collected from the databases, and after eliminating duplicate articles, 148 articles were assessed based on their title and abstract, resulting in 20 full-text articles that met the inclusion criteria and were evaluated by all authors, and nine full-text studies were included in our review. Each author carried out an individual search of the database, independently evaluating the retrieved studies and their full-text publications to determine eligibility based on the criteria, and any differences in including full-text studies were resolved by all researchers.

### Inclusion criteria

Studies that evaluate safety and efficacy of MGB surgery.

Publications include observational studies, systematic reviews/meta-analyses and Clinical trials

Studies include human participants who underwent MGB surgery.

Studies reporting outcomes related to safety (e.g., postoperative complications, adverse events) and efficacy (e.g., weight loss outcomes, resolution of comorbidities).

Studies published in peer-reviewed journals or other credible sources.

Studies conducted in any geographic location or setting.

Studies published from ten years ago

Studies published in English language (or translated into English).

### Exclusion criteria

Studies that do not specifically focus on MGB surgery.

Animal studies, in vitro studies, and non-human research.

Case reports, editorials, commentaries, and letters.

Studies with insufficient data or incomplete reporting.

Studies with a few sample size (e.g., case series with fewer than 10 participants).

Studies that do not report relevant outcomes related to safety or efficacy.  
Non-English language studies without an available translation.

All authors independently collected data from the studies selected for analysis. Problems were resolved through amicable discussions among the authors. Two investigators from each study extracted general details, while all reviewers cross-checked the information provided in Table 1, which included study location, method, citation, and participant characteristics. Another form, Table 2, encompassed the conclusions and clinical findings.

3. RESULTS

We initially gathered 151 articles, which were reduced to 148 after removing duplicates (Figure 1). These articles were further assessed based on their titles and abstracts, resulting in 20 full-text articles that met the criteria of inclusion. Finally, nine full-text articles were included in the study. The included studies characteristics are summarized in (Table 1 & 2). Two studies in the United Kingdom conducted by Madhok et al., (2016) demonstrated that MGB shows superior weight loss compared to sleeve gastrectomy (SG), while the second study conducted by Hussain and El-Hasani, (2019) demonstrated the safety and efficacy of OAGB/MGB for metabolic syndrome and obesity, with a high success rate in providing definitive surgery options with OAGB/MGB. No mortality was reported, indicating rectifying morbidity with revision options.

Alkhalifah et al., (2018) reported a retrospective review of LSAGB patients in Taiwan and reported preoperative characteristics and postoperative outcomes, the study revealed that according to 2014 research by Musella et al., (2014) LSAGB (laparoscopic single anastomosis gastric bypass) is an effective treatment option for morbid obesity that results in long-term weight reduction and the resolution of comorbidities. They analyzed 974 laparoscopic MGB surgeries conducted in Italy and reported the baseline characteristics of the patients and the occurrence of late complications. Laparoscopic MGB has demonstrated safety and efficacy, with low mortality, morbidity, and favorable weight loss outcomes. Plamper et al., (2017) compared perioperative and early postoperative outcomes between MGB (mini gastric bypass) and SG in super-obese patients in Germany, the study insighted that MGB showed superior weight loss and lower complication rates compared to SG in super-obese patients.

Akool et al., (2021) performed laparoscopic SG and gastric mini bypass surgeries in obese patients with type 2 diabetes in Iraq. They concluded that MGB surgery was more effective than SG in controlling type 2 diabetes without medication in the short-term. Al-Motalib et al., (2020) conducted a study in Egypt, reporting that the efficacy of laparoscopic mini gastric bypass surgery, has no mortality, acceptable complications, and high excess weight loss. In India, a study conducted by Kular et al., (2014) reported that MGB and LSG were safe and effective bariatric procedures. The MGB group showed better weight loss progression than the LSG group. A study in France conducted by Bruzzi et al., (2015) confirmed that LMGB is safe, effective, and improves the quality of life, stable outcomes, and good functional results. Additionally, LMGB is effective in treating life-threatening comorbidities such as type 2 diabetes.

Table 1 included studies characteristics

Citation	Participant characteristics	Study method	Study country
Madhok et al., 2016	Patients had BMI 60 kgm <sup>2</sup> , underwent MGBOAGB or SG.	Comparison between mini gastric bypass and SG in patients. Analyzed data, collected by BM, to compare weight loss outcomes	United Kingdom
Alkhalifah et al., 2018	LSAGB patients: Mean age 33.6 years	<ul style="list-style-type: none"><li>- A retrospective analysis of patients treated with LSAGB at Min-Sheng General Hospital in Taoyuan, Taiwan, between October 2001 and December 2015.</li><li>- Preoperative evaluation, which included a physical examination, specialised consultation, laboratory evaluation, and history.</li><li>- Gathering information from a prospectively kept database about weight loss, surgical results, baseline characteristics, and comorbidity resolutions.</li><li>- A follow-up is planned for the first, third, sixth, and twelve months, and thereafter once a year.</li></ul>	Taiwan

		- SPSS software was used for the statistical analysis, and two-sample t-tests and Chi-square tests were used to compare the data baseline.	
Plamper et al., 2017	Super-obese patients compared: MGB group (169 patients) and SG group (118patients)	Comparison of perioperative and early postoperative outcomes between MGB and SG	Germany
Musella et al., 2014	475 men and 499 women underwent laparoscopic MGBs. Mean age of patients was 39.4 years with a BMI of 48.	A review of super-obese patients who had SG and MGB in the past. Evaluation of MGB and SG's perioperative and early postoperative results. From 2006 to 2012, 974 laparoscopic MGB procedures were performed. There are three regional hospitals, two private hospitals, and one university centre among the participating centres.	Italy
Akool et al., 2021	35 obese and morbidly obese patients with type 2 diabetes participated.	There were laparoscopic SG and gastric mini bypass procedures carried out. At 3, 6, 12, and 24 months following surgery, patients were observed.	Iraq
Al-Motalib et al., 2020	Patients aged puberty to 55 years, applicable for 1-year follow-up. Exclusion criteria: chronic obstructive airway, bronchial asthma, syndromes, monogenetic disease, GERD	One hundred severely obese patients had laparoscopic MGB surgery. gastrojejunostomy, trocars, and staplers are used in a five-port procedure.	Egypt
Kular et al., 2014	118 LSG patients matched with 104 MGB patients.	Retrospective analysis of prospectively collected database comparing MGB and LSG. Univariate analysis with chi-square tests and T tests for data analysis.	India
Hussain and El-Hasani, (2019)	Patients aged 18-68, mean age 44. 68% women, 32% men. BMI range 33-79, mean 48 kg/m2. Preoperative weight 96-235 kg, mean 123.4 kg.	Study conducted retrospectively on 527 OAGB/MGB procedures performed between 2014 and 2018. Information gathered from surgeons' data sheets and patient notes	United Kingdom

**Table 2** Main findings and conclusion of included studies

Citation	Findings	Conclusion
Madhok et al., 2016	MGB produces better weight reduction than SG in persons who are obese. In neither the MGB nor the SG groups were there any deaths or significant problems. Patients on MGB saw noticeably more weight reduction after six months, a year, and two years.	When compared to SG, mini gastric bypass shown advantages in weight loss.
Alkhalifah et al., 2018	Long-term weight loss and comorbidity resolution are the outcomes of LSAGB. The revision rate for laparoscopic RYGB and LSG is higher than that of LSAGB.	Long-term weight reduction and comorbidity resolution are demonstrated with LSAGB. The revision rate for laparoscopic RYGB and LSG is higher than that of LSAGB. The long-term results of LSAGB are either superior to other treatments or neither inferior.

Musella et al., 2014	The MGB series' endoscopic results do not raise any serious concerns.	MGB is a long-lasting, reliable, and low-risk bariatric treatment. MGB provides long-term weight reduction and comorbidity resolution outcomes that are adequate. Long-term efficacy of MGB surpasses that of Roux-en-Y gastric bypass (RYGB) in a number of areas.
Akool et al., 2021	Patients saw effective outcomes from SG and MGB. SG was less effective than MGB for managing type 2 diabetes. The BMI and HbA1c values changed significantly after both procedures.	Gastric mini bypass is more efficient than SG in diabetes control. MGB and LSG are two safe and efficient bariatric techniques. Compared to LSG, MGB exhibits superior weight loss after five years. Post-op GERD was often seen in LSG.
Al-Motalib et al., 2020	Excellent effectiveness with little side effects, no mortality, and considerable excess weight loss. Remission rates for hypertension, sleep apnea, diabetes, fatty liver, and hyperlipidemia. Simple, safe, efficient, simple to learn, and reversible is OAGB/MGB. Better results for weight reduction and comorbidities as compared to LSG (Laparoscopic Sleeve Gastrectomy) and RYGB	Laparoscopic mini gastric bypass is effective, safe and reversible procedure. MGB has acceptable complications, mortality rates, and high excess weight loss. MGB is an excellent alternative to RYGB for treating diabetic obese patients
Kular et al., 2014	In the initial years, MGB and LSG exhibit comparable weight decrease. Five years later, LSG's %EWL is lower than MGB's. After LSG, post-operative GERD is more prevalent.	
Bruzzi et al., 2015	After five years, LMGB revealed safe, effective results along with an improvement in quality of life. Results of weight loss were positive. Patients' T2DM, HTN, and HLD were treated successfully with LMGB. Following LMGB, all co-morbidities showed improvement, according to long-term follow-up.	LMGB enhanced quality of life and was safe and effective. All co-morbidities showed improvement throughout the long-term follow-up.
Hussain and El-Hasani, (2019)	High effectiveness, no death, and notable reduction in weight. Comorbidities such as sleep apnea and hypertension are resolved. Modest choices address morbidity without causing death.	The largest trial conducted in UK revealed safe and satisfactory metabolic syndrome outcomes. Options for OAGB/MGB modification address morbidity without increasing mortality.

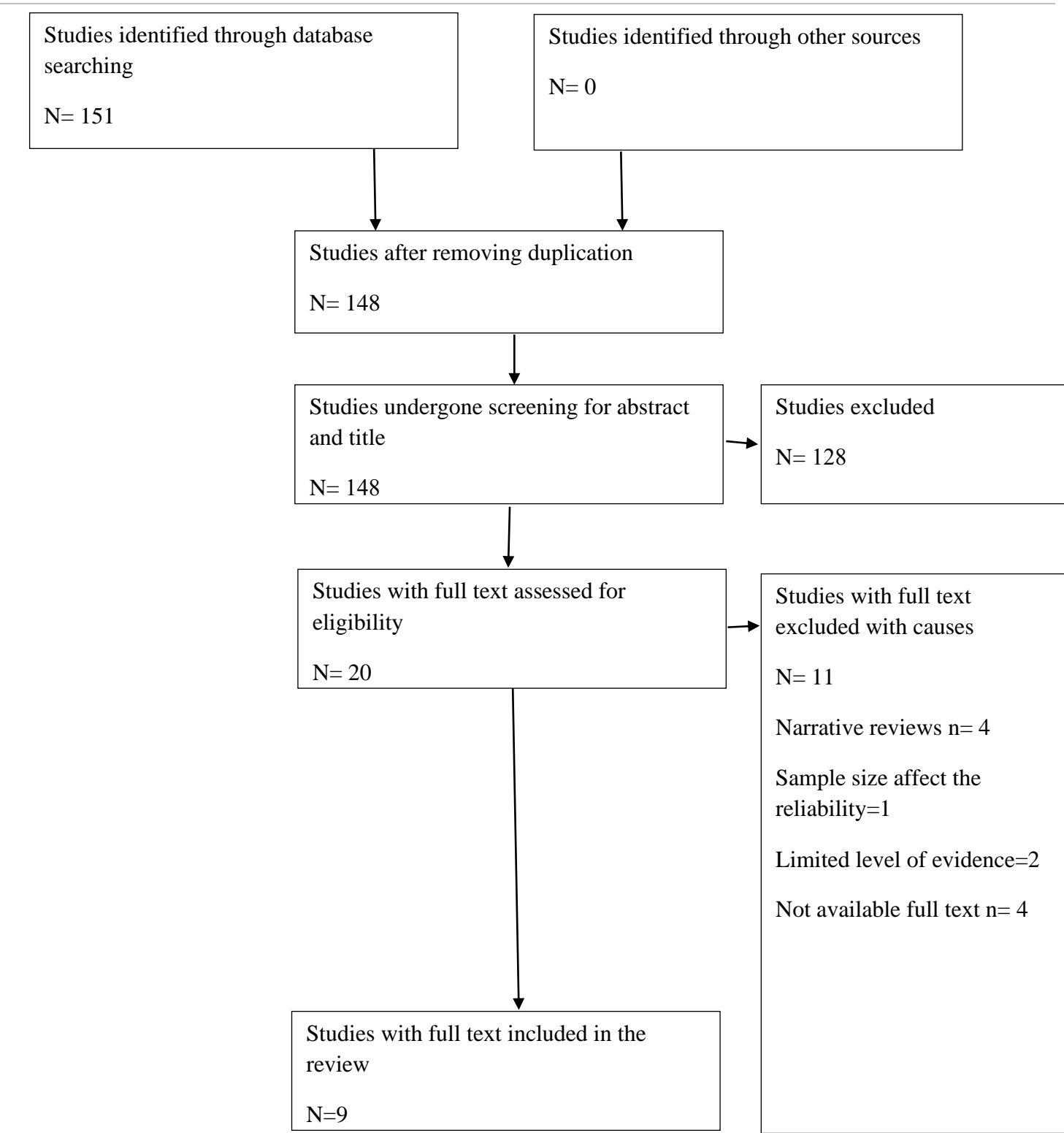


Figure 1 Consort chart of selection process

4. DISCUSSION

Mini-Gastric Bypass technique was reviewed by the originators Rutledge, Kular, Manchanda. MGB is a nonobstructive, restrictive procedure with a low risk and excellent outcomes. Surgeons' confusion was addressed, and MGB's technical details were presented



with 20 years of experience. Laparoscopic MGB is a widely practiced bariatric surgery technique that has gained popularity across various nations globally. India, in particular, has witnessed the increasing prominence of MGB as the second most prevalent procedure, superseding the conventional Roux-en-Y Gastric Bypass (RYGB) and only surpassing SG. MGB was devised to overcome the limitations of RYGB and enhance its outcomes. The fundamental steps of the procedure involve the construction of a gastric conduit along the lesser curvature, extending either to or below the "crow's foot", and establishing an anastomosis to an anti-colic loop of the jejunum positioned 150 to 200 cm distal to the Trietz ligament.

MGB is a combination of a Billroth II ante-colic Loop gastro-jejunostomy and a "non-obstructive" Collis Gastroplasty, which involves elongating the oesophagus. Rutledge conducted the first MGB procedure in 1997, between the period of open bariatric surgery and the advent of Minimally Invasive Surgery (Rutledge et al., 2019). The use of MGB remains controversial in the bariatric community. MGB is not inferior to other bariatric procedures and is suitable for metabolic surgeries (Mahawar et al., 2016). Madhok et al., (2016) reported that MGB/OAGB yielded superior weight loss compared with SG at 6 months, 1 year, and 2 years after surgery. No mortality or major complications were observed in either the MGB/OAGB or SG group. Patients with MGB/OAGB had significant greater weight loss than those with SG. In addition, Plamper et al., (2017) concluded that MGB had superior weight loss at 1 year compared with SG.

MGB had a lower 30-day complication rate than SG. MGB group showed better EWL and lower BMI after one year. Therefore, MGB may be superior to SG for the treatment of super-obesity. LSAGB showed sustained weight loss and a high resolution of comorbidities. LSAGB had higher weight loss than laparoscopic RYGB and LSG. LSAGB (MGB) had a lower revision rate than laparoscopic RYGB or LSG. Laparoscopic SAGB had better weight loss than laparoscopic RYGB and LSG. LSAGB avoids complications, such as intestinal obstruction and internal herniation. LSAGB leads to sustained weight loss and the resolution of comorbidities (Alkhalifah et al., 2018). Another study showed that gastric mini-bypass is more effective than SG for diabetes control. They added that MGB is a low-risk, effective, durable bariatric procedure. MGB showed 77% excess weight loss at 60 months. T2DM remission rate with MGB was 84.4%. The resolution of hypertension with MGB is 87.5% (Musella et al., 2014).

Laparoscopic mini gastric bypass is effective, safe, and reversible procedure and is associated with minor complications, mortality rates, and high excess weight loss. MGB is an excellent alternative to RYGB for treating diabetic obese patients (Akool et al., 2021). The OAGB/MGB technique simplifies bariatric surgery with lower complications and mortality. High excess weight loss and remission rates for associated comorbidities. Significant reduction in BMI and post-surgery weight with improved outcomes as Remission rates for diabetes, hypertension, dyslipidemia, and other comorbidities. MGB has Positive impact on lipid profiles and blood pressure post-surgery. The procedure has acceptable complications and mortality rates (Al-Motalib et al., 2020). However, LSG and MGB are both effective weight loss procedures, the MGB group showed better weight loss at 2 and 5 years of age. Patients in the MGB group showed better metabolic strength and GERD remission. LSG has persistent GERD after 5 years (Kular et al., 2014). The outcomes of 126 patients who underwent LMGB showed a long-term safety profile.

LMGB was effective for treating metabolic co-morbidities like T2DM, HTN, and HLD. Quality of life improved post-LMGB with no significant differences in symptoms (Bruzzi et al., 2015). The safety and high efficacy of OAGB/MGB with no mortality provide a good service for patients with metabolic syndrome and obesity. OAGB/MGB induces effects through nonobstructive restriction, metabolic changes, and malabsorption. OAGB/MGB has low complications, high patient satisfaction, and favorable outcomes as OAGB/MGB showed 83% T2DM remission rate over 1year, weight loss range from 41 to 125%, hypertension resolution rates were 61-58% over 3 years, 99% of sleep apnea patients improved symptomatically, and the mortality rate was zero with no reported chronic postoperative pain (Hussain and El-Hasani, 2019).

## 5. CONCLUSION

A systematic review was conducted to evaluate the safety and efficacy of mini gastric bypass surgery. These findings indicate that MGB is a secure and efficient procedure for morbid obesity treatment. Numerous studies have reported favorable long-term outcomes and low rate of complication associated with MGB. Patients undergoing MGB experienced significant weight loss, surpassing that of other bariatric procedures such as SG. Furthermore, MGB demonstrated a high success rate in resolving comorbidities, such as type 2 diabetes mellitus and hypertension. Complications, such as marginal ulcer and reflux esophagitis, were relatively infrequent. Overall, this systematic review study provides substantial evidence supporting the safety and efficacy of MGB surgery for managing morbid obesity.

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**Informed consent:** Not applicable.

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**Data and materials availability:** All data sets collected during this study are available upon reasonable request from the corresponding author.

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