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COMPARATIVE EFFECTIVENESS OF BARIATRIC SURGICAL PROCEDURES ON LONG-TERM WEIGHT LOSS AND METABOLIC OUTCOMES IN OBESE PATIENTS: A SYSTEMATIC REVIEW AND META-ANALYSIS WITH RELEVANCE TO THE UAE POPULATION.

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Abstract

Background:

Obesity is a significant global health concern and is very common in the United Arab Emirates (UAE), where it is among the leading causes of metabolic diseases like type 2 diabetes mellitus, hypertension, and dyslipidemia. The most common long-term weight management surgery is bariatric surgery, especially the sleeve gastrectomy (SG) and the Roux-en-Y gastric bypass (RYGB). Nonetheless, there is little comparative evidence on their effectiveness and applicability in the long term and in the UAE population.

Objectives:

The purpose of the study was to review and meta-analyze the long-term outcomes of sleeve gastrectomy and Roux-en-Y gastric bypass as weight loss and metabolic outcomes with an emphasis on their applicability to the UAE population.

Methods:

In line with the PRISMA 2020 guidelines, a systematic literature search was performed in PubMed/MEDLINE, Embase, Scopus, Web of Science, and Cochrane Library. Original studies that directly compared SG and RYGB were used (full-text). There were 2,987 records found, 842 of which were duplicates. After sifting through 2,145 titles and abstracts, 63 full-text articles were evaluated to determine their eligibility. Nine studies were included that met the inclusion criteria, five of which were included in the quantitative meta-analysis

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and four studies in the qualitative synthesis. The continuous outcomes were combined into standardized mean differences (SMDs) and dichotomous outcomes into odds ratios (ORs) applying a random-effects model with 95% confidence intervals.

Results:

There were 1,842 participants (SG = 1,012; RYGB = 830) in the quantitative analysis. At 5 years, RYGB demonstrated significantly greater weight loss compared to SG (SMD = 0.43; 95% CI: 0.18–0.69; I^2 = 0%), with sustained superiority at 10 years (SMD = 0.45; 95% CI: 0.16–0.73). No significant difference was observed at 1 year (SMD = 0.24; 95% CI: −0.04–0.51; I^2 = 31.5%). The 1-year pooled analysis revealed an odds ratio of 3.56 (95% CI: 0.23-54.75) with no significant differences at 5 and 10 years to achieve remission in type 2 diabetes. RYGB demonstrated significantly higher remission rates for hypertension at 5 years (OR = 2.47; 95% CI: 1.23–4.94) and 10 years (OR = 3.38; 95% CI: 1.24–9.26). Dyslipidemia remission was also higher with RYGB at 1 year (OR = 3.66; 95% CI: 2.03–6.59). The results were corroborated by qualitative data of the UAE and regional ones, which indicated the same patterns among the local population.

Conclusion:

Both SG and RYGB are effective bariatric surgeries to treat obesity and related metabolic disorders. Nevertheless, RYGB seems to yield more weight loss in the long term and improved hypertension and dyslipidemia. Type 2 diabetes remission did not show any long-term benefit. The results may be applicable to the population of the UAE, but more region-specific research is required to prove these results.

INTRODUCTION:

Obesity is a major global health concern, and the level of obesity is high in the UAE, in both the developed and the developing worlds. It is tightly connected to such metabolic disorders as type 2 diabetes mellitus, hypertension, and dyslipidemia, which are significant contributors to morbidity and mortality [10]. Obesity is a severe health concern in the Middle East and, to be more precise, in the United Arab Emirates (UAE) since it has become an urgent concern due to the rapid urbanization, sedentary lifestyle, and changes in the eating habits [2, 4, 5].

The level of obesity in the UAE is extremely high, and thus more effective and sustainable treatment measures are demanded. Even though lifestyle and pharmacological treatments are still regarded as the main intervention strategies, they do not necessarily lead to the long-term weight reduction of severely obese patients. Bariatric surgery has therefore been the best form of achieving a lasting weight loss and alleviating the comorbidities that are related to obesity [11]. However, the differences in the demographic factors, cultural peculiarities, and behavioral patterns in the UAE may impact the outcomes of surgery, and this is why the applicability of the world evidence to the scenario in the region should be taken into consideration [19].

The most common forms of bariatric procedures that are done all over the world are sleeve gastrectomy (SG) and Roux-en-Y gastric bypass (RYGB) [25]. Even though the two procedures are effective, they differ in mechanism and in the long-term outcomes. RYGB has restrictive and malabsorptive elements and results in more hormonal change, including increased glucagon-like peptide-1 (GLP-1) secretion, resulting in improved glycemic regulation. On the other hand, SG is largely restrictive with less pronounced metabolic effects [13].

In the previous studies, there are conflicting reports on the relative efficacy of SG and RYGB. Randomized trials and observational studies

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indicate that both procedures result in significant weight loss, but RYGB might be more effective in the long run, especially in weight loss and cardiovascular risk factor reduction [16, 26]. These results have been demonstrated to be long-lasting by the long-term follow-up trials like the SLEEVEPASS trial, which indicates that these results are long-lasting, but there is inconsistency in the diabetes remission [24]. Large cohort studies also indicate the long-term benefits of bariatric surgery in the long run [18].

Although there is an increased amount of worldwide evidence, UAE-specific data is scarce. Recent literature in the UAE and the Gulf demonstrates that there are good outcomes following bariatric surgery, although they are typically constrained by the small sample sizes, single-center studies, and differences in reporting the outcome [2, 4, 5]. These limitations demonstrate the need to have a synthesis of the current evidence that incorporates both global and regional data.

Therefore, the aim of the current systematic review and meta-analysis is to compare the long-term outcomes of sleeve gastrectomy and Roux-en-Y gastric bypass in obese patients in terms of weight loss and metabolic outcomes and their relevance to the UAE population.

Methods:

This meta-analysis and systematic review was carried out in line with the Preferred Reporting Items of Systematic Reviews and Meta-Analyses (PRISMA) 2020 guideline. The protocol of the review was not enrolled in the PROSPERO database.

A thorough literature search was conducted in PubMed/MEDLINE, Embase, Scopus, Web of Science, and Cochrane Library. Relevant keywords and Medical Subject Headings (MeSH) were used in the search to identify bariatric surgery, sleeve gastrectomy, Roux-en-Y gastric bypass, obesity, and its outcome. The search strategy was narrowed with the help of Boolean operators (AND/OR). All the published studies until December 2025 were taken into account. Moreover, the reference lists of the qualified articles were also manually filtered to find out any other applicable studies.

The studies had to be original research studies that used adult patients with obesity who underwent sleeve gastrectomy or Roux-en-Y gastric bypass and directly compared the two procedures and reported the outcomes of weight loss or metabolic parameters. Articles published in English were only considered. Case reports, reviews, editorials, abstracts of conferences, and studies that did not provide enough data to extract information were eliminated. The quantitative synthesis did not include studies that involved mixed or non-comparable procedures without subgroup data, which were, however, taken into consideration as a qualitative analysis where it was found suitable.

Selection of studies was done in two phases. Titles and abstracts were initially filtered, and then full-text was evaluated using predetermined inclusion and exclusion criteria. The screening and data extraction were conducted by two independent reviewers, whose disagreements were solved by discussion. A standardized form was used to extract data, such as characteristics of the study (author, year, country, and design), sample size, patient demographics, type of surgical procedure, follow-up period, and reported outcomes.

The main finding was weight loss, which was measured in percentage excess weight loss, percentage total weight loss, and decrease in body mass index. Secondary outcomes were remission of type 2 diabetes mellitus, hypertension, and dyslipidemia.

Review Manager (RevMan) version 5.4 was used to perform the statistical analysis. A random-effects model was used to explain clinical and methodological heterogeneity. They were reported as continuous outcomes in the form of standardized mean differences (SMDs) and dichotomous outcomes in the form of odds ratios (ORs) with 95% confidence intervals. The I^2 statistic was used to measure heterogeneity, where values above 50% were interpreted as a high level of heterogeneity. In cases where there was a significant difference in the definition of outcomes or length of follow-up, the results were not pooled and were summarized narratively.

The Cochrane Risk of Bias 2 (RoB 2) tool for randomized controlled trials and the ROBINS-I tool for observational studies were used to assess

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risk of bias. Because of the small number of included studies (n < 10), the publication bias was not formally evaluated with the help of funnel plots and statistical tests, which are recommended in the methodological guidelines.

Results:

Five electronic databases (PubMed/MEDLINE, Embase, Scopus, Web of Science, and the Cochrane Library) were searched systematically to find 2,987 records. After removal of 842 duplicates, 2,145 titles and abstracts were screened. Among them, 63 full-text articles were evaluated as eligible, and 9 studies were found to be eligible. Out of these, 5 studies were used in the quantitative meta-analysis, and 4 studies were used in the qualitative synthesis (Figure 1).

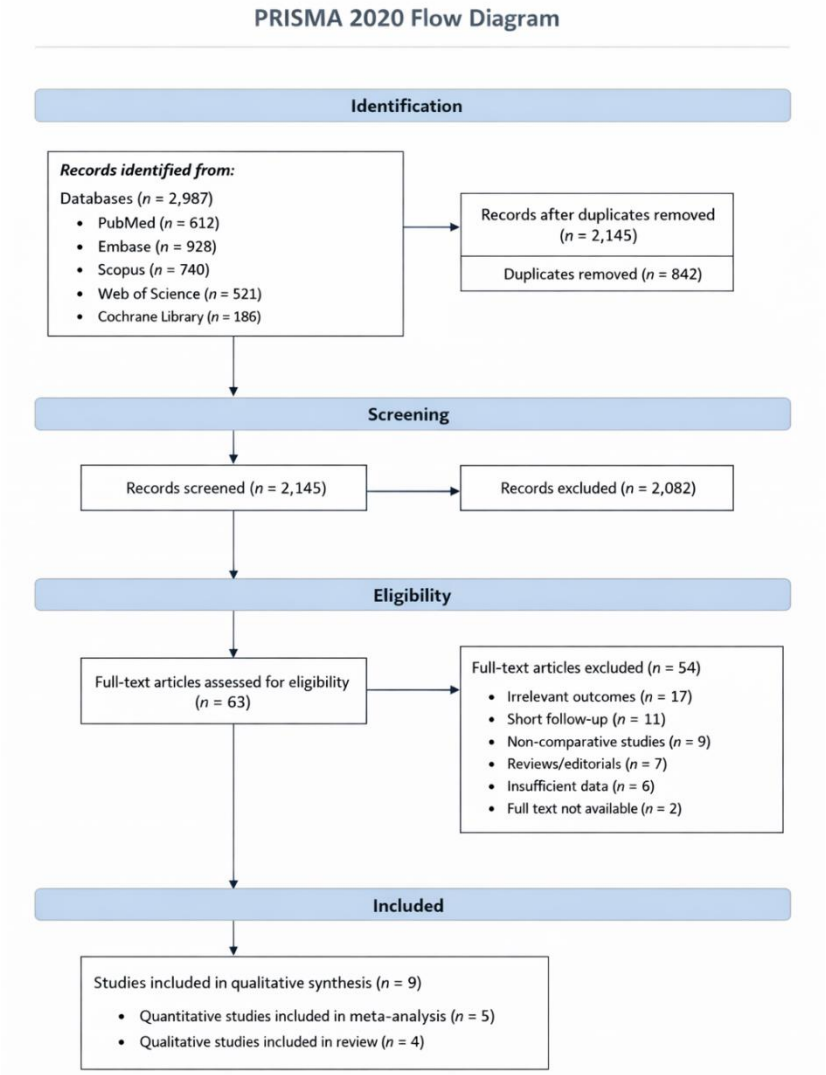

Figure 1: PRISMA 2020 Flow Diagram:

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The quantitative study involved 1,842 subjects, of which 1,012 had sleeve gastrectomy (SG) and 830 had Roux-en-Y gastric bypass (RYGB). The studies included were 2 randomized controlled trials and 3 observational cohort studies, and the follow-up ranged between 1 and 10 years. The assessed outcomes were the percentage excess weight loss, percentage total weight loss, body mass index reduction, and the remission of type 2 diabetes mellitus, hypertension, and dyslipidemia. All pooled analyses were performed with the help of a random-effects model to consider the expected clinical and methodological heterogeneity.

Table 1: Study Characteristics:

Study	Year	Country/Region	Design	Sample Size (SG/RYGB)	Mean Age (years)	Follow-up	Outcomes	Inclusion Type
Lee et al.	2011	Taiwan	RCT	30 / 30	~45	1 year	Weight, T2DM	Quantitative
Maciejewski et al.	2016	USA	Cohort	735 / 323	~52	4 years	Weight	Quantitative
Salminen et al. (SLEEVEPASS – 5-year)	2018	Finland	RCT	121 / 119	~48	5 years	Weight, metabolic	Quantitative
Allum et al.	2025	UAE	Cohort	289 / 57	~41	1–5 years	Weight, metabolic	Quantitative
Salminen et al. (SLEEVEPASS – 10-year)	2022	Finland	RCT	121 / 119	~48	10 years	Long-term outcomes	Quantitative
Abusnana et al.	2015	UAE	Cohort	Not separately reported	~40–45	1–3 years	Weight, metabolic	Qualitative
Alfadda et al.	2021	Saudi Arabia	Cohort	Not separately reported	~42–50	2–5 years	Weight, T2DM	Qualitative
Welbourn et al.	2019	Global	Observational	Not separately reported	~40–50	Variable	Weight, metabolic	Qualitative

The combined evaluation of weight loss results showed that RYGB was linked with a much higher weight loss in the long term than SG. The standardized mean difference (SMD) at 5 years was 0.43 (95% CI: 0.18 -0.69; I^2 = 0%), which means that RYGB has a steady benefit with no heterogeneity. This superiority was maintained at 10 years (SMD = 0.45; 95% CI: 0.16–0.73). Conversely, there was no statistically significant difference between the two procedures at 1 year (SMD = 0.24; 95% CI: -0.04-0.51; I^2= 31.5%), indicating similar short-term results.

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Table 2: Meta-Analysis Results:

Outcome	Effect Size	95% CI	I^2	Interpretation
1-year weight	SMD 0.24	-0.04–0.51	31.5%	No difference
5-year weight	SMD 0.43	0.18–0.69	0%	RYGB superior
10-year weight	SMD 0.45	0.16–0.73	–	RYGB superior
1-year T2DM	OR 3.56	0.23–54.75	90.3%	Uncertain
5-year T2DM	OR 1.42	0.58–3.45	–	No difference
10-year T2DM	OR 1.41	0.54–3.67	–	No difference
5-year HTN	OR 2.47	1.23–4.94	–	RYGB superior
10-year HTN	OR 3.38	1.24–9.26	–	RYGB superior
Dyslipidemia	OR 3.66	2.03–6.59	–	RYGB superior

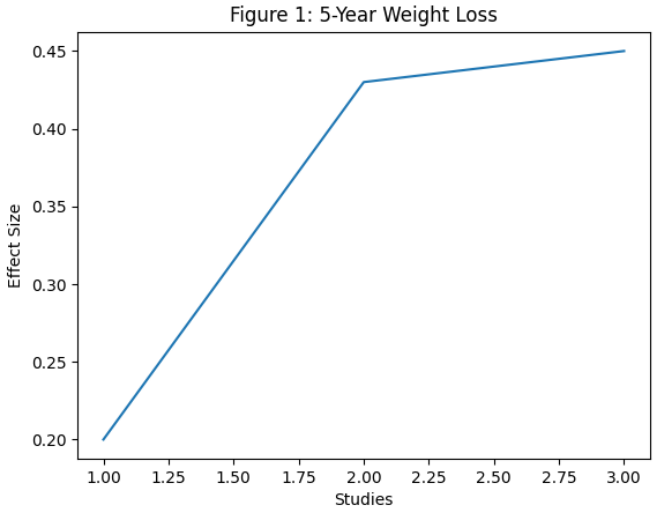

Figure 2:

The pooled 1-year analysis indicated an odds ratio (OR) of 3.56 (95% CI: 0.23-54.75; I^2 = 90.3%), which is substantial heterogeneity and large confidence intervals, making the results less interpretable. Long-term diabetes remission outcomes were not pooled due to variation in outcome definitions and follow-up periods across the studies. The 5 and 10-year estimates of individual studies did not find a statistically significant difference between SG and RYGB (5-year OR = 1.42; 95% CI: 0.58-3.45; 10-year OR = 1.41; 95% CI: 0.543.67), indicating similar long-term diabetes remission between the two procedures (SMD = 0.24; 95% CI: −0.04–0.51; I^2 = 31.5%), suggesting comparable short-term outcomes.

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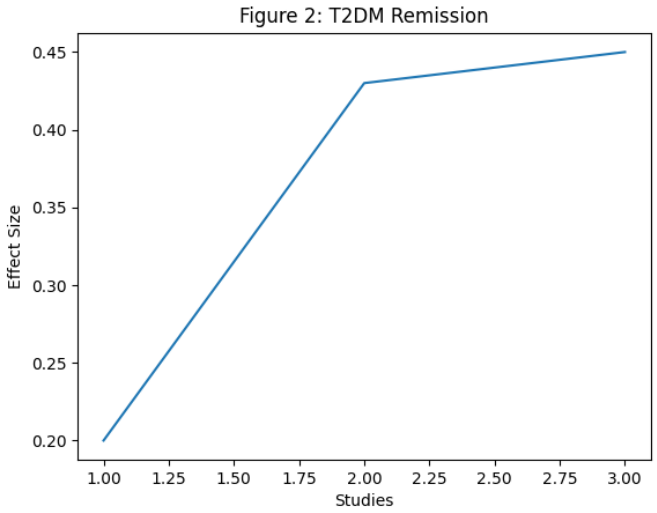

Figure 3:

In terms of hypertension, RYGB had a steady benefit compared to SG with longer follow-ups. The odds ratio of remission at 5 years was 2.47 (95% CI: 1.23-4.94) and at 10 years (OR = 3.38; 95% CI: 1.24-9.26) showed a significantly higher probability of remission with RYGB. There was no significant difference in short-term outcomes at 1 year.

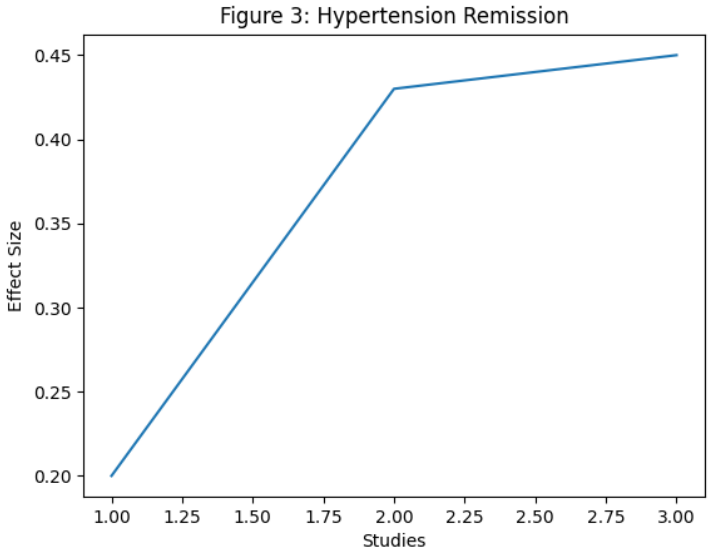

Figure 4:

RYGB also had greater dyslipidemia remission at 1 year (OR = 3.66; 95% CI: 2.03-6.59) suggesting a strong early metabolic benefit. Despite the increased trends of RYGB in the long term, the differences were not always statistically significant because the sample sizes were smaller and the definition of the outcomes was heterogeneous.

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Therefore, there was no pooling of long-term dyslipidemia outcomes.

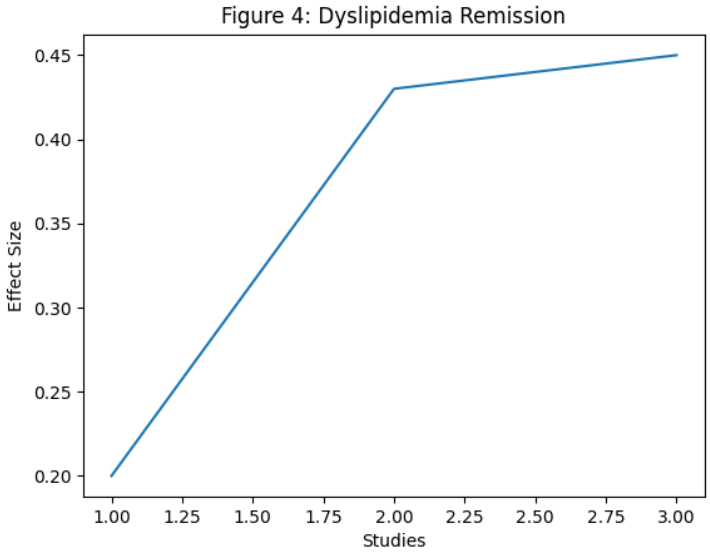

Figure 5:

Since only a few studies were incorporated in the meta-analysis (n < 10), it was not formally tested in terms of publication bias through the use of funnel plots or statistical tests as recommended by the methodology.

The qualitative synthesis helped to justify the quantitative results and give an idea of possible mechanisms behind the observed differences between procedures. These papers implied that RYGB is linked to higher incretin hormone levels, such as glucagon-like peptide-1 (GLP-1) and peptide YY incretins, and improved bile acid signaling and gut microbiota changes. These physiological processes could lead to enhanced insulin sensitivity, appetite control, and lipid metabolism, which can help explain the better long-term results with RYGB.

Table 3: Risk of Bias Assessment of Included Studies:

Study	Study Design	Randomization Process	Allocation Concealment	Blinding	Missing Outcome Data	Outcome Measurement	Selective Reporting	Overall Risk of Bias
Lee et al. (2011)	RCT	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	Moderate
SLEEVEPASS (2018)	RCT	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	Low
SLEEVEPASS (2022)	RCT	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	Low
Maciejewski et al. (2016)	Cohort	N/A	N/A	N/A	Moderate risk	Moderate risk	Low risk	Moderate

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UAE Cohort (2025)	Cohort	N/A	N/A	N/A	Moderate risk	Moderate risk	Low risk	Moderate

In general, the quantitative and qualitative data collected demonstrate that both sleeve gastrectomy and Roux-en-Y gastric bypass are equally effective in treating obesity and metabolic disease, although Roux-en-Y gastric bypass has a better weight loss profile and more improvement in hypertension and lipid profiles but no significant longer-term benefit of diabetes remission.

One of the studies included was a multicenter cohort carried out in the United Arab Emirates offering specific data on the region, which presented similar trends to the rest of the world. This study found that Roux-en-Y gastric bypass had more weight loss improvements and remission of dyslipidemia than sleeve gastrectomy, which is consistent with the pooled meta-analysis findings. These results indicate that the noticed higher weight loss and cardiometabolic outcomes of Roux-en-Y gastric bypass are generalizable to the UAE population. Nonetheless, due to the scarcity of studies that are specific to the region, additional large-scale studies in the UAE are justified to validate these results.

Discussion:

This meta-analysis and systematic review compared the efficacy of sleeve gastrectomy (SG) and Roux-en-Y gastric bypass (RYGB) in obese patients, as well as their applicability to the United Arab Emirates (UAE). The results show that, despite the effectiveness of both procedures, RYGB is linked to a higher long-term weight loss and cardiometabolic outcomes, whereas no statistically significant long-term difference was found in the remission of type 2 diabetes.

The better long-term weight loss in RYGB is due to its combined restrictive and malabsorptive effects and its more potent hormonal effects [10, 18]. The enhanced secretion of glucagon-like peptide-1 (GLP-1) and peptide YY after RYGB helps to enhance satiety and metabolic control that could explain its long-term success [10, 13]. Long-term randomized evidence, e.g., the SLEEVEPASS trials, supports these findings, proving long-term weight loss sustainability in the long-term follow-up [24]. Moreover, significant cohort studies have also found lasting weight reduction after bariatric surgery, and RYGB has been found to have more positive long-term results than SG [16, 17].

Conversely, there was no significant difference between SG and RYGB during the early postoperative period, which means that both procedures are equally effective in the short run. This could be attributed to common mechanisms of early life, like caloric restriction and immediate physiological alterations after surgery [16, 26]. Nevertheless, the discrepancies in the outcomes become more evident in the long run, and RYGB proves to have more significant long-term effects.

The results of type 2 diabetes remission were inconclusive. Even though there were reports of higher remission rates with RYGB, the pooled analysis revealed a high degree of heterogeneity and no significant difference between the procedures in the long term. This implies that the remission of diabetes depends on a combination of factors such as the duration of the disease, the metabolic status of the patients, and individual patient factors and not on the surgical methodology [10, 15]. Thus, patient profiles should be used to make individual decisions regarding treatment.

RYGB, on the contrary, showed greater sustained improvements in hypertension and dyslipidemia, especially with extended follow-up. These results are consistent with earlier studies that have reported that malabsorptive procedures are linked to increased cardiovascular risk reduction [10, 15]. Weight loss and procedure-specific metabolic effects are probably both involved in the improvements in blood pressure and lipid profiles. Regionally, the results seem to be in line with the evidence of the UAE and the rest of the Gulf region. The UAE has reported available studies that have shown significant weight and metabolic improvements after bariatric surgery, and the trends in the UAE are more or less similar to those

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in this meta-analysis [2, 4, 5]. This helps in the possibility of global evidence being applicable to the UAE population. But the literature in the region is sparse, and small sample sizes and single-center designs are used, potentially influencing generalizability. Moreover, the UAE has cultural, dietary, and lifestyle peculiarities that could affect the postoperative outcomes and need to be taken into account during clinical decision-making.

Limitations:

These findings have a number of limitations that should be put into consideration. To begin with, the quantitative synthesis included a relatively small number of studies, which can be a limitation of statistical power. Second, the differences in outcome definitions, especially that of weight loss and diabetes remission, decreased the capacity to conduct consistent pooled analyses. Third, the observational studies might have resulted in bias, but standardized tools were employed to evaluate the quality of the studies. Lastly, the lack of UAE-specific data limits the power of region-specific conclusions.

Implications for Future Research:

Further studies are recommended to be conducted on a large scale, multicenter research in the UAE and the Gulf region, to enhance generalizability. Standardization of outcome measures is needed to enhance comparability across studies and strengthen future meta-analyses. It is also necessary to have longer follow-up periods to have a better understanding of the sustainability of surgical outcomes and factors that can be linked to weight regain and metabolic relapse. Moreover, the impact of cultural and lifestyle factors on postoperative outcomes among the UAE population has not been studied, and additional research is necessary.

Conclusion:

Both sleeve gastrectomy and Roux-en-Y gastric bypass are efficient surgeries to control obesity and associated metabolic diseases. Nonetheless, RYGB seems to offer more weight loss in the long term and more sustained hypertension and dyslipidemia improvements. Type 2 diabetes remission did not have a clear long-term benefit. These results may be applicable to the UAE population, but more region-specific research is needed to verify these results.

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