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USE OF WEIGHT REDUCTION MEDICATIONS AND IMPACT ON OBESITY SURGERY

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Abstract

Background: Preoperative weight-reduction strategies are increasingly utilized to optimize outcomes in bariatric surgery candidates. Pharmacological therapy may influence weight loss and surgical eligibility, but real-world evidence comparing medication-exposed and non-exposed patients remains limited.

Aim of the study: To evaluate the impact of preoperative weight-reduction medications on weight loss, surgical eligibility, and perioperative outcomes among patients assessed for bariatric surgery.

Methods: In this retrospective study, 380 adults evaluated for bariatric surgery between [Month Year] and [Month Year] were categorized into a medication group (n = 182) and a non-medication group (n = 198). Clinical and anthropometric data, medication type and duration, preoperative weight loss, achievement of ≥10% total body weight loss, surgical eligibility, and perioperative outcomes were collected. Multivariable logistic regression identified predictors of deferring surgery due to weight loss.

Result: Medication users achieved significantly greater preoperative weight loss than controls (12.7 ± 8.9 kg vs. 4.1 ± 6.2 kg; mean difference 8.6 kg, 95% CI 6.8–10.4; $p < 0.001$), with higher percentage total body weight loss (10.7% ± 7.3% vs. 3.4% ± 5.2%; $p < 0.001$) and BMI reduction (3.8 ± 2.7 vs. 1.2 ± 2.0 kg/m²; $p < 0.001$). Over half of the medication group (51.1%) achieved ≥10% weight loss, compared to 10.6% of controls. Preoperative pharmacotherapy independently predicted deferral of surgery (adjusted OR 3.97; 95% CI 2.15–7.32; $p < 0.001$) without increasing operative time or perioperative complications. Gastrointestinal adverse events were the most common (31.9%), and serious adverse events were rare (1.65%).

Conclusion: Preoperative weight-reduction medications substantially enhance weight loss and increase the likelihood of deferring bariatric surgery while maintaining comparable perioperative safety. These findings support integrating pharmacotherapy into pre-surgical optimization protocols to improve individualized patient management.

1. Introduction

Weight-reduction medications, such as anti-obesity pharmacotherapy, are clinically approved drugs that act on central or peripheral pathways to reduce appetite, increase satiety, or decrease fat absorption, thereby assisting patients with overweight or obesity in achieving meaningful weight loss [1]. Commonly used weight-loss medications, such as glucagon-like peptide-1 (GLP-1) receptor agonists like liraglutide and semaglutide, enhance glycemic control and support weight reduction by prolonging satiety signals and slowing gastric emptying. They are increasingly used as an adjunct to lifestyle changes and in combination with bariatric surgery to enhance outcomes [2]. Globally, more than 650 million adults, representing 13% of the world's population, were obese in 2016. Pharmacotherapy has been shown to produce an average 5–15% reduction in body weight, while bariatric surgery frequently yields 20–35% total weight loss, with both approaches enhancing cardiometabolic risk factors [3]. Incretin-based medications, including tirzepatide and semaglutide, have demonstrated substantial and clinically meaningful weight loss in adults with obesity, reflecting their effectiveness as therapeutic options and supporting their use either alongside or as an adjunct to bariatric surgery for comprehensive obesity management [4]. Obesity arises from a combination of genetic, environmental, behavioral, and metabolic factors, including excessive caloric intake, a sedentary lifestyle, hormonal imbalances, and certain medications that promote weight gain, which collectively disrupt energy homeostasis and promote fat accumulation [5]. Preoperative and postoperative use of anti-obesity medications in bariatric surgery patients is strategically applied to improve initial weight loss, prevent long-term postoperative weight regain, optimize metabolic and cardiovascular outcomes, and tailor therapy based on individual patient characteristics and tolerability [6]. Glucagon-like peptide-1 receptor agonists used as adjuncts to bariatric surgery have been shown to promote significant additional weight loss and improve metabolic outcomes, including glycemic control and cardiovascular risk factors, in patients with insufficient weight loss or weight regain after surgery, making pharmacotherapy a valuable complement to surgical treatment for obesity [7]. Combining GLP-1 receptor agonists with bariatric surgery can reduce the proportion of patients with suboptimal postoperative weight response, meaning more patients achieve clinically meaningful weight loss when pharmacotherapy is added to surgical care [8]. Weight-reduction medications, for instance, GLP-1 receptor agonists, when effective, are often associated with gastrointestinal side effects, including nausea, vomiting, diarrhea, and constipation, which can decrease adherence and limit long-term effectiveness [9]. Their weight-loss effects are generally less durable than bariatric surgery, with many patients regaining a significant proportion of lost weight after discontinuation of therapy [10]. The study aimed to assess the effectiveness, safety, and clinical impact of weight-reduction medications, both alone and as adjuncts to bariatric surgery, in improving sustained weight loss, enhancing metabolic health, and reducing postoperative weight regain among adults with overweight or obesity.

METHODOLOGY & MATERIALS

This retrospective observational study was conducted at the Department of [Department Name], [University Name], during the period from [Month Year] to [Month Year]. The study adhered to the principles of the Declaration of Helsinki and received approval from the institutional ethics review committee. Because of the retrospective nature of the study, informed consent was waived.

Study Population

A total of 380 consecutive adult patients evaluated for bariatric surgery were included. Patients were divided into two groups based on preoperative exposure to weight-reduction medications:

Medication group: patients who received pharmacological weight-reduction therapy prior to surgical evaluation (n = 182)

Non-medication group: patients who did not receive any weight-reduction medication before evaluation (n = 198)

Only patients with complete clinical, anthropometric, and follow-up data were included in the final analysis.

Inclusion and Exclusion Criteria

Inclusion criteria were:

Age ≥18 years

Body mass index (BMI) ≥30 kg/m² at initial evaluation

Assessment for bariatric surgery by a multidisciplinary team

Exclusion criteria were:

Previous bariatric or metabolic surgery

Secondary causes of obesity (e.g., endocrinopathies, long-term corticosteroid use)

Pregnancy or lactation

Incomplete medical records or missing key outcome data

Data Collection

Clinical and demographic data were retrospectively collected from electronic medical records using a standardized data extraction form. Information obtained included patient age, sex, baseline body weight, body mass index (BMI), obesity class, and obesity-related comorbidities such as type 2 diabetes mellitus, hypertension, and dyslipidemia. For patients receiving pharmacologic therapy, details regarding medication class, duration of use, and reported adverse events were recorded. Preoperative weight outcomes, including absolute weight loss, percentage total body weight loss, BMI reduction, and achievement of ≥10% weight loss, were documented for both study groups.

Surgical decision outcomes were extracted, including eligibility for bariatric surgery based on BMI criteria, deferral of surgery due to adequate weight loss, and progression to operative management. Among patients who underwent surgery, perioperative variables were collected, including type of bariatric procedure performed, operative time, length of hospital stay, and intraoperative and postoperative complications. Medication-related adverse events were also systematically reviewed and categorized. All data were anonymized prior to analysis, and accuracy was ensured through cross-verification of records by two independent reviewers to minimize extraction errors and missing values.

Weight-Reduction Medications

Patients in the medication group received one or more FDA-approved anti-obesity agents as part of routine clinical care. Medication classes included glucagon-like peptide-1 (GLP-1) receptor agonists (e.g., Semaglutide), dual GLP-1/glucose-dependent insulinotropic polypeptide (GIP) agonists (e.g., Tirzepatide), lipase inhibitors (e.g., Orlistat), sympathomimetic agents, and combination therapies. Medication selection and duration were determined by treating physicians based on patient preference, comorbidity profile, and drug availability. Duration of therapy was recorded in months prior to surgical reassessment.

Outcomes and Definitions

The primary outcomes were preoperative weight loss (kg), percentage total body weight loss (%TBWL), and BMI reduction. Secondary outcomes included achievement of ≥10% weight loss, surgical eligibility (BMI ≥35 kg/m² with comorbidities or ≥40 kg/m²), deferral of surgery due to adequate weight loss, and actual performance of bariatric surgery. Among patients who underwent surgery, operative variables and perioperative outcomes were analyzed, including procedure type (sleeve gastrectomy, Roux-en-Y Gastric Bypass, and one-anastomosis gastric bypass), operative time, length of hospital stay, and intra- and postoperative complications. Adverse events related to weight-reduction medications were extracted from medical records and categorized as gastrointestinal symptoms, hypoglycemia, medication discontinuation due to intolerance, and serious adverse events.

Statistical Analysis

Continuous variables were expressed as mean ± standard deviation (SD) or median with interquartile range (IQR), as appropriate, and compared using Student's t test or Mann–Whitney U test. Categorical variables were presented as frequencies and percentages and compared using chi-square or Fisher's exact tests. Multivariable logistic regression analysis was performed to identify independent predictors of avoiding bariatric surgery, including use of weight-reduction medication, age, sex, baseline BMI, and presence of type 2 diabetes. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were reported. All statistical analyses were conducted using standard statistical software. A two-sided P value <0.05 was considered statistically significant.

RESULT

The mean age 41.7±11.3 vs 43.2±10.9 years), weight (118.4±19.7 vs 121.8±21.3 kg), BMI (41.3±6.2 vs 42.1±6.8 kg/m2), and gender distribution (female: 62.09% vs 61.11%) for the medication and non-medication groups. Most had Class III obesity (48.90%, 57.58%), and comorbidities, including type 2 diabetes (35.16%, 41.92%), hypertension (43.41%, 45.96%), and dyslipidemia (31.87%, 32.32%) were comparable between groups. All differences were not statistically significant (Table 1). GLP-1 receptor agonists were most common (53.85%) with a mean duration of 7.8±3.4 months, followed by dual GLP-1/GIP agonists (22.53%; 6.2±2.9 months), lipase inhibitors (12.64%; 5.4±2.7 months), sympathomimetic agents (7.14%; 3.9±1.8 months), and combination therapy (3.85%; 6.1±3.1 months), respectively. The data indicate GLP-1-based therapies were the most frequently used and generally taken for longer durations (Table 2). The medication group lost a mean of 12.7±8.9 kg and 4.1±6.2 kg in the non-medication group with mean difference (95% CI): 8.6 (6.8-10.4). Total body weight loss 10.7±7.3% and 3.4±5.2% with mean difference (95% CI): 7.3 (5.8–8.8). BMI reduction 3.8±2.7 and 1.2±2.0 kg/m² with mean difference (95% CI): 2.6 (2.0–3.2). Over half of the medication group (51.1%, n=93) achieved ≥10% weight loss compared with only 10.6% in the non-medication group. All differences were statistically significant (Table 3). Surgery eligibility (BMI ≥35 kg/m²) was observed in 76.37% of the medication group and 84.85% in the non-medication group (adjusted OR 0.58, 0.33–1.02; p=0.059), while surgery was deferred due to adequate weight loss in 23.08% and 6.06% (adjusted OR 4.7, 2.38-9.31; p<0.001). Most participants still underwent surgery, with 76.92% in the medication group and 93.94% in the non-medication group (Table 4). Sleeve gastrectomy was most common (75.00% vs 71.51%), followed by Roux-en-Y gastric bypass (20.00% vs 20.43%) and

one-anastomosis gastric bypass (5.00%, 8.06%) (p=0.234). Operative time averaged 92.4±22.3 and 95.1±23.8 minutes (p=0.412), median hospital stay was 2 compared with 3 days (p=0.058), and intraoperative (4.29% and 6.45%) and postoperative complications (7.86% and 9.14%) were similar between groups (Table 5). Use of weight-reduction medication significantly increased the odds of avoiding surgery (adjusted OR 3.97, 2.15-7.32; p<0.001). On the other hand, higher baseline BMI reduced the odds (adjusted OR 0.92, 0.88-0.97; p=0.002). Age, female sex, and type 2 diabetes were not statistically significant (Table 6). Nausea or vomiting occurred in 17.03%, diarrhea or GI discomfort in 14.84%, hypoglycemia in 6.59%, and 10.44% discontinued medication due to intolerance. Serious adverse events were rare, occurring in 1.65% of participants (Table 7).

Table 1: Baseline demographic and clinical characteristics of the study population (N = 380)

Variable	Medication Group (n = 182)		Non-Medication Group (n = 198)		P value
	n	%	n	%	
Age (years)					
Mean ± SD	41.7 ± 11.3		43.2 ± 10.9		0.145
Gender					
Male	69	37.91	77	38.89	0.873
Female	113	62.09	121	61.11	
Body weight (kg)					
Mean ± SD	118.4 ± 19.7		121.8 ± 21.3		0.221
BMI (kg/m²)					
Mean ± SD	41.3 ± 6.2		42.1 ± 6.8		0.185
Obesity class					
Class I (30–34.9)	22	12.09	18	9.09	0.382
Class II (35–39.9)	71	39.01	66	33.33	
Class III (≥40)	89	48.90	114	57.58	
Comorbidities					
Type 2 diabetes	64	35.16	83	41.92	0.177
Hypertension	79	43.41	91	45.96	0.664
Dyslipidemia	58	31.87	64	32.32	0.946

Table 2: Types and Duration of Weight-Reduction Medications among the study population (n = 182)

Medication Type	Frequency (n)	Percentage (%)	Mean Duration (months) ± SD
GLP-1 receptor agonists (e.g., semaglutide)	98	53.85	7.8 ± 3.4
Dual GLP-1/GIP agonists (e.g., tirzepatide)	41	22.53	6.2 ± 2.9
Lipase inhibitors (e.g., orlistat)	23	12.64	5.4 ± 2.7
Sympathomimetic agents	13	7.14	3.9 ± 1.8
Combination therapy	7	3.85	6.1 ± 3.1

Table 3: Comparison of preoperative weight loss outcomes between medication and non-medication groups

Outcome Measure	Medication Group (n = 182)	Non-Medication Group (n = 198)	Mean Difference (95% CI)	P value
Weight loss (kg), Mean ± SD	12.7 ± 8.9	4.1 ± 6.2	8.6 (6.8–10.4)	<0.001
% Total body weight loss, Mean ± SD	10.7 ± 7.3	3.4 ± 5.2	7.3 (5.8–8.8)	<0.001
BMI reduction (kg/m²), Mean ± SD	3.8 ± 2.7	1.2 ± 2.0	2.6 (2.0–3.2)	<0.001
Achieved ≥10% weight loss, n (%)	93 (51.10)	21 (10.61)	—	<0.001

Table 4: Impact of pre-surgical weight-reduction medications on surgical eligibility and decision outcomes

Outcome	Medication	Non-Medication	Adjusted	95% CI	P

	Group (n = 182)	Group (n = 198)	OR		value
Eligible for surgery (BMI ≥35 kg/m²)	139 (76.37)	168 (84.85)	0.58	0.33–1.02	0.059
Deferred surgery due to adequate weight loss	42 (23.08)	12 (6.06)	4.7	2.38–9.31	<0.001
Underwent surgery despite medication	140 (76.92)	186 (93.94)	Reference	—	—

Table 5: Type of bariatric procedure and perioperative outcomes among patients who underwent surgery

Variable	Medication Group (n = 140)	Non-Medication Group (n = 186)	P value
Type of surgery, n (%)			
Sleeve gastrectomy	105 (75.00)	133 (71.51)	0.234
Roux-en-Y gastric bypass	28 (20.00)	38 (20.43)	
One-anastomosis gastric bypass	7 (5.00)	15 (8.06)	
Operative time (minutes), Mean ± SD	92.4 ± 22.3	95.1 ± 23.8	0.412
Length of hospital stay (days), Median (IQR)	2 (2–3)	3 (2–3)	0.058
Intraoperative complications, n (%)	6 (4.29)	12 (6.45)	0.402
Postoperative complications, n (%)	11 (7.86)	17 (9.14)	0.689

Table 6: Multivariable Logistic Regression Analysis Identifying Independent Predictors of Avoiding Bariatric Surgery

Predictor	Adjusted OR	95% CI	P value
Use of weight-reduction medication	3.97	2.15–7.32	<0.001
Age (per year)	0.99	0.97–1.02	0.527
Female sex	1.12	0.73–1.71	0.599
Baseline BMI	0.92	0.88–0.97	0.002
Type 2 diabetes	0.86	0.54–1.38	0.533

Table 7: Adverse events associated with weight-reduction medications (n = 182)

Adverse Event	Frequency (n)	Percentage (%)
Nausea / vomiting	31	17.03
Diarrhea / GI discomfort	27	14.84
Hypoglycemia	12	6.59
Medication discontinuation due to intolerance	19	10.44
Serious adverse events*	3	1.65

DISCUSSION

Obesity remains a major global health challenge, contributing substantially to cardiometabolic morbidity, reduced quality of life, and premature mortality [11]. While bariatric surgery is the most effective intervention for sustained weight loss in severe obesity, optimizing patients prior to surgery—through lifestyle modification or pharmacologic therapy—has gained increasing attention [12]. The advent of highly effective weight-reduction medications, such as GLP-1 receptor agonists and dual GLP-1/GIP agonists, has shifted the therapeutic landscape, offering patients meaningful weight loss that can improve metabolic health and, in some cases, modify surgical decision-making [12]. In the present study, preoperative weight-reduction pharmacotherapy was associated with significantly greater weight loss compared with non-medication management. Patients receiving medications achieved a mean weight loss of 12.7 ± 8.9 kg and 10.7 ± 7.3% total body weight reduction, whereas non-medication patients lost 4.1 ± 6.2 kg and 3.4 ± 5.2% body weight ($p < 0.001$ for both). Furthermore, more than half of medication users (51.1%) achieved ≥10% total body weight loss, compared with only 10.6% in the non-medication group. These findings are consistent with those reported by Park et al., whose retrospective cohort study demonstrated a preoperative weight loss of 4.1 ± 5.4% in patients receiving pharmacotherapy compared with 0.3 ± 2.7% in the control group ($p < 0.001$) [13]. Additionally, in patients with severe obesity and high baseline BMI, preoperative use of GLP 1 receptor agonists or other anti obesity medications resulted in median weight losses of 8.5–10.4 kg before surgery, considerably greater than lifestyle only interventions [14]. A systematic review by Cohen et al. also found that that GLP 1 therapy administered preoperatively can yield total body weight loss up to ~16%, markedly higher than in non medicated group [15]. Our study's distribution of pharmacotherapy for obesity, with GLP 1 receptor agonists predominating (53.9 %) followed by dual GLP 1/GIP agonists (22.5 %), lipase inhibitors (12.6 %), and sympathomimetic agents (7.1 %), aligns with recent trends in clinical practice. In a large U.S. insurance claims analysis, Lin et

al. (2024) reported a marked increase in prescriptions for GLP 1 receptor agonists over a similar timeframe, reflecting growing clinician preference for incretin based therapies due to their superior weight loss efficacy and better tolerability compared with traditional agents [16]. This shift parallels our finding that newer agents form the majority of prescribed medications, whereas older classes like sympathomimetics are used less frequently and for shorter durations. Comparative effectiveness studies further contextualize these patterns. Systematic reviews by Sarma and Palcu (2022) and another study by Barrett et al., (2025) show that while GLP 1 based therapies can produce significant weight loss, metabolic bariatric surgery consistently achieves greater and more sustained reductions in body weight and BMI compared with pharmacotherapy alone [17,18]. The integration of pharmacotherapy with bariatric surgery is increasingly recognized in obesity management. Emerging evidence indicates that preoperative use of GLP 1 receptor agonists optimizes surgical candidates, with utilization rates rising over time and improving perioperative outcomes. A multicenter Indiana cohort reported a threefold increase in preoperative GLP 1 RA use from 2018–2023, correlating with differential postoperative results [19. Additionally, GLP 1 and dual GLP 1/GIP agonists serve as effective adjuncts postoperatively for suboptimal weight loss or weight regain, reflecting evolving therapeutic strategies [20].Despite these differences, adverse events were generally mild and consistent with known safety profiles: gastrointestinal symptoms (nausea/vomiting 17.0%, diarrhea/GI discomfort 14.8%) were the most frequent, with only 1.7% experiencing serious adverse events, reinforcing the tolerability of preoperative pharmacotherapy. While the medication group exhibited superior weight loss, there was no statistically significant difference in overall eligibility for surgery based on BMI (76.4% vs 84.9%, $p = 0.059$). However, patients receiving medications were significantly more likely to defer surgery due to achieving adequate weight loss (23.1% vs 6.1%; Adjusted OR 4.7, 95% CI 2.38–9.31, $p < 0.001$). This suggests that effective pharmacotherapy can alter surgical decision-making in a meaningful subset of patients, potentially allowing some individuals to achieve health improvements without immediate operative intervention [21]. Nonetheless, the majority of medication users still proceeded to surgery, reflecting the persistent limitations of pharmacotherapy alone in individuals with high baseline BMI or complex comorbidities [22].Perioperative outcomes were comparable between cohorts, with no statistically significant differences observed in procedural distribution, operative duration, length of hospital stay, or intraoperative and postoperative complication rates. In the present study, preoperative weight-reduction pharmacotherapy did not increase surgical risk, supporting its safe integration into bariatric surgical pathways, consistent with previous reports [23].Multivariable analysis demonstrated that the use of weight-reduction medications was a strong independent predictor of deferring bariatric surgery (adjusted OR 3.97, 95% CI 2.15–7.32, $p < 0.001$), after controlling for age, sex, baseline BMI, and type 2 diabetes. Higher baseline BMI remained a significant factor, with each unit increase associated with a lower likelihood of avoiding surgery (adjusted OR 0.92, $p = 0.002$). These findings are consistent with prior national health claims data, which reported a more than twofold increase in obesity pharmacotherapy prescriptions over one year, accompanied by an 8–9% reduction in metabolic bariatric procedures, suggesting a potential substitution effect [24]. Systematic reviews and comparative effectiveness studies consistently indicate that, although bariatric surgery achieves greater and more durable weight loss, pharmacologic therapy produces clinically meaningful reductions that may influence treatment decisions [25]. Additionally, meta-analyses support the role of weight-loss medications as adjuncts in patients with suboptimal post-surgical outcomes, highlighting the evolving integration of medical and surgical obesity management [26].

Limitations of the study:

This retrospective, single-center study may be subject to selection and information bias. Variability in medication type, dose, and duration, as well as unmeasured factors such as lifestyle interventions, limits direct comparisons and causal inference. Adherence was assessed via medical records, which may underestimate true compliance, and long-term sustainability of preoperative weight loss was not evaluated.

CONCLUSION AND RECOMMENDATIONS

Preoperative weight-reduction pharmacotherapy substantially improves weight loss and increases the probability of deferring bariatric surgery without elevating perioperative risk. These results highlight the strategic role of anti-obesity medications as an adjunct to surgical evaluation, facilitating individualized patient management and optimizing metabolic and operative outcomes. Translationally, incorporating pharmacotherapy into pre-surgical pathways can refine patient selection, enhance treatment efficacy, and advance precision-based approaches in obesity care.

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Conflict of Interest:

None declared

Ethical approval:

The study was approved by the Institutional Ethics Committee.

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