International Journal of Clinical Science and Medical Research

ISSN(print): 2770-5803, ISSN(online): 2770-582X

Volume 04 Issue 06 June 2024

DOI: https://doi.org/10.55677/IJCSMR/V4I6-04/2024, Impact Factor: 7.606

Page No : 197-208

Weight Loss Failure Post-Bariatric Surgery

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ABSTRACT

Bariatric surgery (BS) is the most effective intervention for obesity, with proven significant weight loss, complications prevention, comorbidity remission, and improved survival. However, a substantial proportion of patients experience weight loss failure after BS. This review aims to provide an updated insight into weight loss failure after BS, define it, identify its prevalence, explain its health impact, determine risk factors, and summarize prevention and treatment. Future directives and larger-scale prospective studies should be considered to define weight regain (WR) and insufficient weight loss post bariatric surgery and address measures to resolve gaps and controversies.

Published Online: June 13, 2024

KEYWORDS:
Obesity, Bariatric surgery, Insufficient weight loss, Weight regain.

INTRODUCTION

The World Health Organization defines overweight and obesity as "abnormal or excessive fat accumulation that may impair health." (1). Body mass index (BMI) is used to classify a person as overweight (BMI 25–29.9) or obese (BMI ≥ 30kg/m^2). In addition, obesity is further subclassified: class I (BMI 30–34.9 kg/m2), class II (BMI 35–39.9 kg/m2), and class III (BMI > 40 kg/m2), which is also considered severe obesity (2).

Between 1975 and 2016, obesity prevalence tripled worldwide and has reached a pandemic level (3). The global burden of overweight and obesity is expected to increase, as the projected numbers of people with overweight and obesity by 2030 are 2.16 billion and 1.12 billion, respectively (4). A recent survey from all regions of the Kingdom of Saudi Arabia found a 24.7% self-reported prevalence of obesity (5). The association between obesity and morbidity, mortality, and a negative impact on quality of life is well documented (6, 7). The increased risk of chronic comorbidities related to obesity is the main factor leading to the health and economic burden of obesity (8). Treatment of obesity includes lifestyle modification as the first step and foundation for all interventions, pharmacotherapy, and bariatric surgeries (9, 10).

According to the International Federation for Surgery for Obesity and Metabolic Disorders (IFSO), there are six types of bariatric surgeries; three of them are more frequently done, including sleeve gastrectomy (SG), also known as vertical sleeve gastrectomy (VSG), Roux-en-Y gastric bypass (RYGB), also called gastric bypass (GBP), and one anastomosis gastric bypass (OAGB), also called a mini-gastric bypass or single anastomosis gastric bypass (SAGB);

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****Cite this Article: Mounther Al Naim, Mareyah Alshaikh Husain, Muneera AlTaweel, Ali Al Qarni, Hamad AlSubaie, Maram AlSubaiee, Abdulrahman Alarfaj, Abdulmohsen, AlMusaad, Maryam AlQahtani, Jawaher AlRashada, Norah Aleid, Bian Alkhazmari, Zafar Iqbal (2024). Weight Loss Failure Post-Bariatric Surgery. International Journal of Clinical Science and Medical Research, 4(6), 197-208***

the other three surgeries are done much less frequently and comprise adjustable gastric banding (AGB), biliopancreatic diversion with duodenal switch (DS), and single anastomosis duodenal-ileal with sleeve Gastrectomy (SADI-S) (11).

The eighth IFSO Global Registry Report (2023) indicated that 480,970 bariatric procedures were performed in 24 countries, with 209,527 procedures performed in the United States of America alone (12).

Bariatric surgery is the most effective intervention for obesity, with proven significant weight loss, prevention of complications, remission of comorbidities, and improved survival (13, 14). However, weight-loss failure is an important outcome after bariatric surgery (14, 15).Despite this critical outcome and its consequences, the definition of weight loss failure post-bariatric surgery needs to be more consistent in the literature (16–23). Hence, this review provides an updated insight into weight loss failure post-bariatric surgery. The review objectives are to define weight loss failure post-bariatric surgery, identify its prevalence, explain its health impact, determine risk factors, and summarize prevention and treatment.

Definition of weight-loss failure:

Bariatric literature has used various definitions to report weight loss and define sufficient weight loss and weight gain outcomes. Some of the proposed definitions include total weight loss (TWL), percent total weight loss (%TWL), percent excess weight loss (%EWL), and change in body mass index (BMI) (24).

The absence of a unified definition for weight loss failure after bariatric surgery has led to variations in how it is defined and assessed across different studies. The post-surgery time point for evaluating weight loss failure is still being determined, as other studies have used varying time frames. Due to these variations, the reported prevalence of weight loss failure can differ significantly in the literature. As a result of this lack of consistency, it is difficult to compare results and draw definitive conclusions about weight loss failure rates after bariatric surgery (25, 26)

To properly understand weight loss failure, it is crucial to establish and define what constitutes successful weight loss after bariatric surgery. In most reports and studies, successful weight loss after bariatric surgery is defined as achieving a weight loss greater than 50% of excess weight loss (EWL) or greater than 20% total body weight loss (TWL). Between 1 and 2 years following the surgery (27, 28, 29, 30). In contrast, the definition of success using medical pharmacological treatments (without bariatric surgery) typically involves achieving a total body weight loss (TWL) of greater than 5% (30). Excess body weight (EW) was defined by a BMI $\geq$ 25 kg/m2 (31). TWL is determined by the formula: TWL (%) = (preoperative weight - follow-up weight) / preoperative weight x 100. The percentage of excess weight loss (%EWL) is calculated using an ideal body weight of BMI 25 as follows: %EWL = (preoperative weight - follow-up weight) / (preoperative weight - ideal body weight) x 100 (30).

According to Deguines et al., successful weight loss in sleeve gastrectomy (SG) is defined by a BAROS (Bariatric analysis and reporting outcome system) score greater than 3 (32). BAROS is a weighted score that has been utilized in many studies to evaluate the success and effectiveness of weight reduction surgery. Successful weight loss according to updated BAROS, includes the following criteria: Loss of at least 50% of excess weight, Resolution of obesity-related comorbidities, Improvement in quality of life (QoL), Positive scores for self-esteem and activity level. BAROS assigns up to 3 points for each criterion and deducts points for complications and reoperations. The final score places results into 5 outcome groups, offering an objective definition of success or failure in bariatric surgery (Figure 1) (33,34).

Weight loss failures can be classified into two categories: insufficient weight loss (IWL) and weight regain (WR) (26, 35, 36). The definition of weight regain after bariatric surgery remains unclear at this stage. Various suggestions have been put forth to define weight regain, which include: (30)

- BMI >35 after initial success of BMI <35 after the initial surgery
- EWL <50% after initial success of >50% EWL after the initial surgery
- Weight regain >25% EWL from the lowest weight (nadir)
- Weight regain >10% from the lowest weight (nadir)
- Not able to maintain >20% TWL at all

Reinhold's criteria define insufficient weight loss as less than 50% EWL or a BMI greater than 35 (37). The time at which insufficient weight loss is judged can vary depending on the study or intervention being examined. According to the following study, IWL was defined as a percent excess weight loss (%EWL) of 50% or less at one year after the primary surgery, and this was the criteria under which revision surgery was recommended to the IWL patients (38). The Swedish Obese Subjects (SOS) study considered the lowest time point for weight loss to be one-year post-surgery (39). Moreover, a multicenter study with a 7-year follow-up found that body weight increases approximately three years after bariatric surgery (40). Considering the variation in studies regarding the timing for evaluating weight loss failure after bariatric surgery (ranging from 1 year to 3 years), it is reasonable to assess it after the honeymoon period, which typically occurs approximately 1 to 3 years following the bariatric procedure (41)

Ultimately, it is imperative to establish standardized reporting guidelines for insufficient weight loss and weight regain. Consistent definitions and criteria in the literature are necessary for accurately comparing and interpreting research findings.

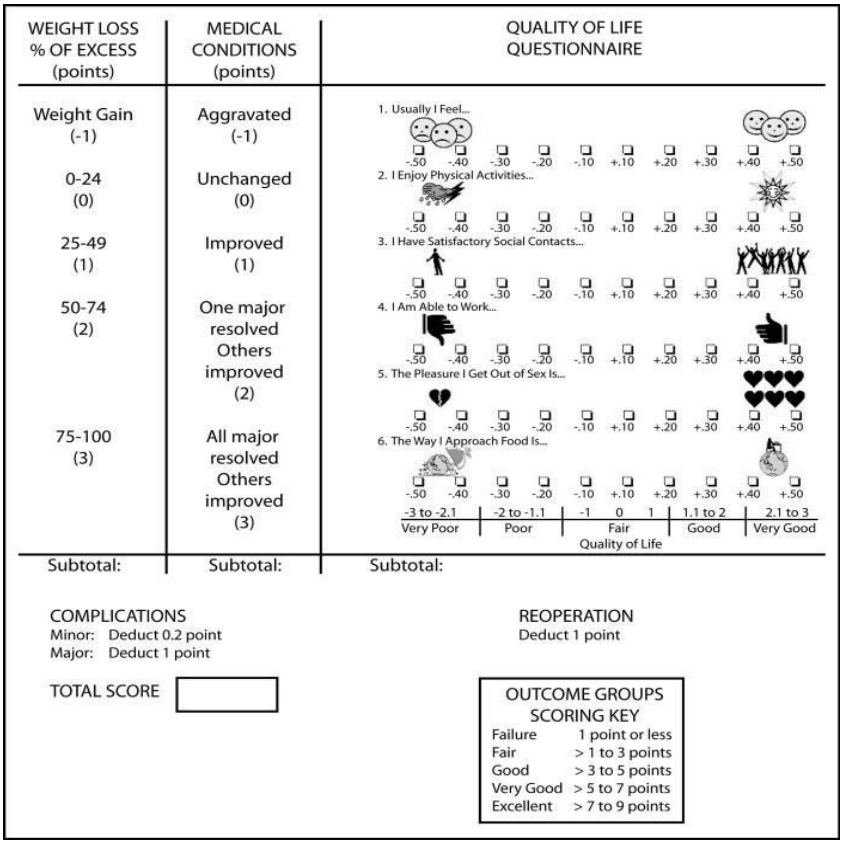

Figure 1(34): Updated Bariatric analysis and reporting outcome system (BAROS) with MooreheadArdelt Quality of Life Questionnaire II scoring key

Determinants of weight loss failure post-bariatric surgery:

1) Anatomical/surgical factor:

Several gastric procedures have been established for the treatment of obesity. These procedures aim to promote weight loss by altering the gastrointestinal system's anatomy and/or physiology (figure 2) (42). Weight loss is highly variable following BS procedures. Biliopancreatic diversion (BPD) provides the most significant weight loss, but also the highest complication rate; sleeve gastrectomy (SG) and Rouxn-Y gastric bypass (RYGB) are similar in the amount of weight loss they induce, while both of those procedures resulted in more significant weight loss than the adjustable gastric band (AGB) (43).

Despite the possibility of WR after BS, studies indicate that most patients maintain a significant portion of their initial weight loss. The maximum weight loss occurred in the surgical subgroups after 1 to 2 years: gastric bypass, 32%; vertical-banded gastroplasty, 25%; and gastric banding, 20%. Following surgery, weight regain was observed in all surgical subgroups, but the trend began to level off after 8 to 10 years ("relapse curves"). Weight loss from baseline stabilized at 25% after ten years (44). At 20 years, the mean total body weight loss is 26 percent after Roux-en-Y gastric bypass (RYGB), 18 percent after verticalbanded gastroplasty (a legacy procedure), 13 percent after adjustable gastric band (AGB), and 1 percent with nonsurgical management. The risk of regain in different surgical techniques within four to five years is estimated to be 2.5 to 3.3 percent after RYGB, 12.5 to 14.5 percent after SG, and 30.5 to 36 percent after AGB (45). Overall, this study provides insight into the long-term outcomes of various bariatric surgical procedures, indicating that while significant weight loss can be achieved initially, weight regain may occur over time. It emphasizes ongoing monitoring and management to maintain successful longterm weight loss.

Ponce et al. showed that substantial WR was rare for patients undergoing RYGB. By four years after surgery, about one in three of those undergoing AGB (61 of 200 [30.5%]) regained all their lost weight (within 5% of baseline), compared to 26 of 17 of those undergoing SG (14.6%) and only 35 of 1431 patients undergoing RYGB (2.5%). Even though patients who regain weight may still have better longterm health outcomes than those who never lose significant weight, WR is one of the reasons the AGB procedure has fallen out of favor in recent years (46)

Weight loss failure mechanisms can vary depending on the type of bariatric operation performed (figure 2)(42). In the case of sleeve gastrectomy (SG), gastric dilation is one associated factor. Weight loss failure in Roux-en-Y gastric bypass (RYGB) can be linked to several factors, including a larger diameter of the gastro-jejunal stoma, gastric pouch dilation, and the presence of a gastro-gastric fistula as a potential surgical complication (26, 47).

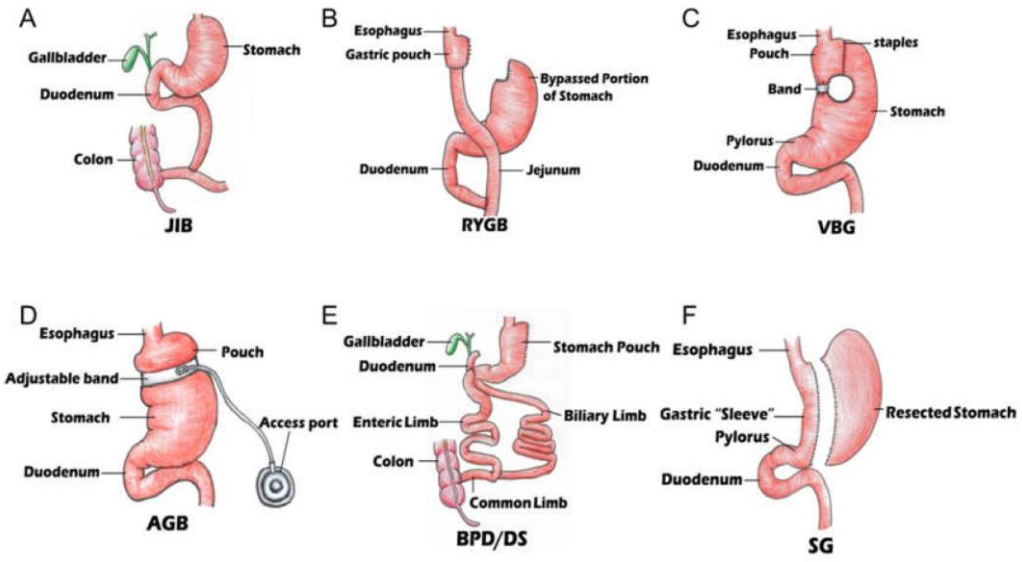

Figure 2 (42): Different types of surgeries: (A) jejunoileal bypass surgery (JIB); (B) Roux-en-Y gastric bypass (RYGB); (C) vertical banded gastroplasty (VBG); (D) adjustable gastric band (AGB); (E): biliopancreatic diversion with duodenal switch (BPD/DS); (F) sleeve gastrectomy (SG).

2) Hormonal factors:

Studies have indicated that ghrelin, serotonin, glucose-dependent insulinotropic polypeptide, glucagonlike peptide-1(GLP-1), peptide YY (PYY), and leptin play a role in weight loss failure (26, 47, 48,49).

In some limited data, weight regain is associated with higher pre-prandial ghrelin levels (a hormone that stimulates appetite) and lower post-prandial GLP-1 levels (a hormone that regulates blood sugar and suppresses appetite). These hormonal imbalances may increase hunger and reduce satiety, potentially leading to weight regain following bariatric surgery (50).

After BS, hormones like pancreatic peptide YY, GLP-1, and gastric inhibitory polypeptide are upregulated, which promotes satiety and reduces hunger. Additionally, ghrelin, an appetite-stimulating hormone, is downregulated, causing a decrease in food intake. However, hormonal changes may occur in the opposite direction as time progresses, contributing to WR (51, 52).

Limited research has been conducted on the metabolic effects of WR after BS, emphasizing the need for further investigation in this area.

3) Social demographics and anthropometric factors:

The impact of older age on weight loss failure following bariatric surgery has been reported in some studies, while others have found no correlation between age and weight loss outcomes (26, 47). Bariatric surgery is more effective in achieving weight loss in younger patients. However, the efficacy of bariatric surgery in terms of weight loss tends to decrease in patients over the age of 50. These older patients may experience reduced changes in anthropometric measures following the procedure (53). The diminished effectiveness of bariatric surgery in older patients regarding weight loss may be attributed to factors such as decreased metabolism, higher prevalence of sarcopenia, and a longer duration for comorbidities to impact the physical condition of patients (54).

Social demographic factors, such as being single, having a low socio-economic status, working in foodrelated jobs, lacking full-time employment, and having low education, can influence the likelihood of weight loss failure following bariatric surgery (55, 47, 56).

The rate of weight loss failure after bariatric surgery is influenced by preoperative BMI, with higher BMI values correlating with a greater likelihood of weight loss failure (47, 55)

A comprehensive review by Livhits et al. found that baseline BMI was inversely related to excess weight loss and nadir weight at the beginning of the weight loss period. In the long term (≥ 36 months of followup), however, the relationship between weight loss and initial BMI became less apparent (57). These findings align with those of the study conducted by Dixon et al. (58).

The relationship between preoperative weight loss and weight loss failure after bariatric surgery varies across studies. Some studies suggest that higher weight loss before surgery is associated with a lower weight loss failure rate. In contrast,

others find no significant effect between preoperative weight loss and weight loss failure (55). No correlation between WR and race has been shown in four studies (59). The impact of gender on weight loss failure has been a subject of ongoing debate (47)

3) Underlying disease and Comorbidity associations:

Underlying comorbidities, including diabetes, high blood pressure, hyperlipidemia, and elevated levels of serum HbA1c and triglycerides, are recognized as risk factors for weight loss failure (55, 47, 60).

A research study, which included 130 patients who underwent bariatric surgery, discovered several factors, like previous history of hypertension and other comorbidities associated with weight loss failure after 12 months (84). A history of abdominal surgery, along with childhood obesity, may be related to weight-loss failure (55,47, 61)

4) Behavioral factors:

Eating behavior is a prominent behavioral factor that often influences weight loss failure (48). Various eating behaviors, such as grazing, binge eating, loss of control eating, picking and nibbling, overeating at night after dinner, nocturnal eating, emotional eating, and external eating, have been associated with weight loss failure (47).

It has been found that postoperative control over food urges plays a significant role in weight maintenance after bariatric surgery. The ability to effectively manage and regulate food urges has been identified in previous research as a predictor of successful weight loss and long-term weight maintenance, suggesting that individuals who can appropriately handle and respond to their food cravings are more likely to achieve and sustain their weight loss goals following bariatric surgery (62)

According to a recent and widely cited study, regular weighing (at least once a week) has been identified as a factor in preventing weight gain. Conversely, risk factors for weight loss failure include consuming fast food more than once a week, eating despite feeling full, continuous snacking throughout the day, engaging in binge eating and loss of control eating, and prolonged sitting time of 4.5 hours or more (60). Weight regain after weight loss may also be associated with consuming large portions, eating excessive food in one sitting, experiencing intense food cravings, and preferring sweet foods (47, 63).

5) Psychological factors and social support:

Personality traits and psychological factors strongly influence weight outcomes post-bariatric surgery. Anxiety is also identified as a predictor of weight outcomes (64). Following BS, psychological variables such as depression, stress, and shape concerns play an important role in predicting weight outcomes. These variables play a central role in the psychopathology of candidates for BS and predict post-surgery eating disorder psychopathology and psychosocial functioning (65).

It is noteworthy that while preoperative psychiatric disorders were found to be a weaker predictor of weight regain (WR) after bariatric surgery (BS), postoperative psychiatric disorders had a more substantial impact on eating behavior, which likely contributed to the observed weight regain (66). The association between depression and anxiety with initial weight loss (IWL) after bariatric surgery (BS) has received less attention in research. However, recent studies have shown that both depression and anxiety significantly predict IWL one year after BS (67). Moreover, Patients with two or more psychiatric conditions were approximately six times more likely to experience no further weight loss or weight regain compared to those with one or fewer psychiatric diagnoses (68).

Social support, including participation in a bariatric support group, is essential to weight loss after bariatric surgery. The bariatric support group program assists patients in meeting follow-up requirements and provides valuable encouragement and guidance. Nutritionists play a role in correcting patient behaviors that impact weight loss (48, 69)

6) Physical inactivity:

In a study by Carnero et al. (70) on 96 patients who underwent bariatric surgery (RYGB), the effects of a 6-month structured exercise program on weight and body composition were monitored. The study found that patients who engaged in moderate physical activity and reduced sedentary time experienced more significant weight loss and more favorable body composition, characterized by lower fat mass and higher muscle mass.

Research has indicated that only 10-24% of patients who have undergone bariatric surgery (BS) meet the physical activity (PA) guidelines for health promotion, which recommend engaging in at least 150 minutes of moderate-to-vigorous physical activity per week in bouts of at least 10 minutes (71).

Inadequate physical activity (PA) and a sedentary lifestyle have been identified as contributors to weight regain (WR) following Roux-en-Y gastric bypass (RYGB) surgery. The incidence of WR tends to be higher among patients who maintain a relatively inactive lifestyle than those who engage in regular physical activity (72).

7) Bariatric clinic follow-up

The frequency and duration of follow-up visits remain a topic of ongoing debate in medical literature. Some studies argue for more frequent follow-ups, particularly in the first year, to monitor recovery, nutritional status, and the management of any complications that may arise (73). Other research

suggests that less frequent but longer-term follow-ups may benefit long-term weight loss maintenance (74). A study by Smith et al. (2019) reviewed the impact of follow-up frequency on patient outcomes after BS and found that more frequent follow-ups within the first year of surgery led to better weight loss outcomes and improved resolution of comorbidities (75).

However, a study by Johnson et al. (2018) found no substantial difference in weight loss outcomes between patients with monthly follow-ups and those with three-monthly follow-ups in the first year postsurgery (73). Martinez et al. (2020) studied the role of follow-up frequency in patient satisfaction after BS. They found that while more frequent follow-ups may lead to better weight loss outcomes, they did not necessarily translate to higher patient satisfaction (74).

Impact of weight loss failure:

A comparative study aimed to identify the clinical implications and predictors of 10-year weight-loss failure in patients who underwent RYGB; the study revealed that most patients experienced substantial health improvements ten years after undergoing Roux-en-Y gastric bypass (RYGB) surgery. However, approximately 10.2% of patients had weight-loss failure, defined as no more than a 0% reduction in excess body mass index (BMI) ten years after the surgery. Despite this, the prevalence of comorbidities decreased in all patients, including those with weight-loss failure. However, patients with weight-loss failure had reduced resolution of apnea and cardiac comorbidities compared to those with successful weight loss (76).

Based on multiple studies, Weight loss failure has been associated with depression, anxiety, alcohol and substance abuse, attentional impulsiveness, personality disorders, the presence of numerous psychiatric conditions, and low self-esteem (47, 60, 63).

Weight loss failure after bariatric surgery negatively impacts the patient's quality of life, leads to the return of comorbidities, and ultimately results in increased medical costs, representing a significant long-term complication and the downside of bariatric surgery (77).

Due to its technical challenges, weight loss failure is particularly significant for bariatric surgeons. Revisional surgery, which is often required in cases of weight loss failure, carries high risks of morbidity and mortality, further highlighting the importance and complexity of addressing this issue (78).

Prevention and treatment:

Diet modifications:

Sarwer et al. summarize those patients receiving nutritional counseling for the first four months after their BS achieved more significant weight loss (79). In a randomized controlled trial (RCT) involving 144 patients who had undergone Roux-en-Y gastric bypass (RYGB) surgery, a nutritional intervention consisting of educational sessions with a dietitian every other week for six weeks led to significantly higher excess weight loss percentage (EWL%) (80% vs. 64%) and more significant reduction in BMI (6.48 ± 4.37 vs. 3.63 ± 3.41) at 12 months compared to usual care (80).

A major contributing factor for WR after surgery was poor dietary adherence, which was shown by increased intake of alcohol and carbohydrates, as well as low nutritional quality (81). These poor habits may be in the form of frequent episodes of eating high-calorie food and drinks. Patients will probably need continuous guidance and supervision from nutritionists and their bariatric team to adhere to dietary recommendations (82).

In another randomized controlled trial (RCT) conducted one year after Roux-en-Y gastric bypass (RYGB) surgery, a structured dietary intervention incorporating portion-controlled foods was compared to usual care. Both groups received behavioral weight loss instructions. The RCT demonstrated that the intervention group had significantly reduced calorie intake at four months and experienced increased weight loss at 4 and 6 months compared to the usual care group (83).

Physical activity:

People who have had BS are found to be less active daily compared to the general population (82). Following BS, exercise training maximizes weight loss and enhances muscular, cardiopulmonary, and overall fitness (84).

Overcoming exercise barriers, such as health concerns, pain, limited gym or park accessibility, and selfconsciousness, can positively impact physical activity levels after bariatric surgery (BS) (85).

Psychological-social Support/ Behavioral Therapy:

Participation in pre-bariatric and post-bariatric surgery support groups is highly recommended since postbariatric surgery is linked to more significant weight decreases (86). In a study involving weight regain (WR) patients after Roux-en-Y gastric bypass (RYGB) surgery, a 6-week program of cognitive and dialectical behavior therapies led to significant weight loss, along with improvements in depressive symptoms, grazing patterns, and binge eating episodes (87). Likewise, an online and phone-based behavioral intervention demonstrated feasibility, acceptability, efficacy, and high satisfaction among participants, with a retention rate of 70% (88).

Shared appointments for post-bariatric surgery typically involve combined meetings with surgical physicians and dieticians (89). Bringing family members, partners, or friends to a follow-up appointment is vital in achieving success post-surgery; this can motivate the patient to attend their follow-

up appointments. Including the patients' support networks in follow-up meetings can help remind patients of the positive behaviors and interventions covered in consultations and motivate them to communicate regularly with their bariatric team (82). A systematic review of 15 behavioral management studies following Roux-en-Y gastric bypass (RYGB) or laparoscopic adjustable gastric banding (LAGB) surgeries revealed that patients who received cognitive behavioral therapy (8 studies) or group support (7 studies) achieved more significant weight loss compared to control groups (86)

Pharmacotherapy:

Recent advancements in weight loss pharmacotherapy have expanded the options for long-term treatment of obesity. A combination of anti-obesity medications and lifestyle modifications is often used to reduce hunger, enhance satiety, and prevent weight regain. USFDA-approved medications for chronic weight management include orlistat, phentermine-topiramate, liraglutide, naltrexone-bupropion, and lorcaserin (90).

In a study involving 319 patients who experienced weight regain or inadequate weight loss after Rouxen-Y gastric bypass (RYGB) or laparoscopic sleeve gastrectomy (LSG), medication use resulted in weight loss of ≥ 5% TBW for 54% of the sample, ≥ 10% TBW for 30.3% of the sample, and ≥ 15% TBW for 15% of the sample (91). In addition, patients who were treated with topiramate had a 1.9-fold higher likelihood of achieving a weight loss of ≥ 10% of their total body weight (TBW) compared to those who received other medications (118). In a study involving young adults with weight regain (WR), the use of topiramate, phentermine, and/or metformin resulted in weight loss of ≥ 5% for 54.1% of the sample, ≥ 10% for 34.3% of the sample, and ≥ 15% for 22.9% of the sample. Among the medications, metformin showed the highest percent weight change compared to the other medications (92).

In an evaluation of liraglutide, a GLP-1 analog known for promoting weight loss, among 117 patients who underwent RYGB, LAGB, or LSG, statistically significant weight loss (-6.3 ± 7.7 kg) was observed after seven months of treatment, regardless of the type of surgery. Furthermore, the weight reduction remained significant after one year of using liraglutide 3 mg, with nausea being the most common side effect (reported by 29.1% of patients) (93). Patients who initiated liraglutide 3.0 mg experienced a notable weight loss within 1 to 2 months, and this weight loss remained significant for up to 1 year of using the medication ($P < .05$). Importantly, the type of bariatric surgery the patients had did not significantly impact the effectiveness of liraglutide in promoting weight loss ($P > .05$) (Figure 3)(93).

On the other hand, A study involving 2,092 patients evaluated the use of liraglutide 3.0 mg in both bariatric surgery and non-surgical patients. After a treatment duration of at least 16 weeks, the median weight loss achieved was approximately 6%, which was similar between the surgical and non-surgical groups (91)

These studies highlight that pharmacotherapy can result in clinically significant weight loss even after initial bariatric surgery. Therefore, it should be considered as a viable treatment option for individuals who do not achieve satisfactory weight loss with primary bariatric surgery.

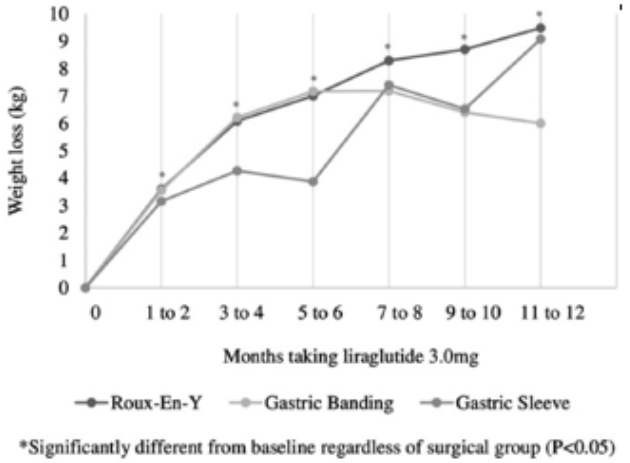

Figure 3. (93) Weight loss while taking liraglutide 3.0 mg over time by type of bariatric surgery.

SURGICAL REVISION

Surgical revision may be indicated to address complications arising from the initial BS, weight regain (WR), or inadequate weight loss (IWL). Revisional surgery can be broadly categorized into corrective, conversion, and reversal (94).

In corrective procedures, the modifications made do not alter the fundamental anatomy of the primary surgery, such as re-banding or re-sleeving. Conversion procedures involve changing the structural anatomy of the primary operation to a different type of surgery. For example, this can include transitioning from a purely gastric surgery like laparoscopic adjustable gastric banding (LAGB) or sleeve gastrectomy (SG) to a gastric and diversionary procedure like Roux-en-Y gastric bypass (RYGB) or adding a malabsorptive component like biliopancreatic diversion (BPD). However, long-term nutritional concerns exist with BPD. On the other hand, reversal procedures involve restoring the original anatomy of the primary procedure, such as gastric band removal or restoring the anatomy after RYGB. Reversal procedures may also serve as an intermediate step towards conversion surgery, such as removing the band before converting to SG or RYGB (94).

Various revisional procedures were assessed in a systematic review of 799 studies focusing on Roux-enY gastric bypass (RYGB) revisions for weight regain (WR). These included two conversions (to distal RYGB or biliopancreatic

diversion/duodenal switch [BPD/DS]) and three revisions (revision of gastric pouch and anastomosis, revision with gastric band, or with endoluminal procedures). The review reported that the mean percentage of excess body mass index loss (%EBMIL) at three years for these five revisional procedures was 52.2%, 76%, 14%, 47.3%, and 32.1%, respectively (95). Revision surgical procedures generally have a higher risk of complications than primary procedures (94).

CONCLUSION AND RECOMMENDATIONS

It's well-established that BS is an efficient intervention that helps many obesity-afflicted persons to maintain healthier lives post-surgery; however, the predicament of absent a precise unified definition for weight loss failure post-BS and outcomes is profound. We, as a group of authors, find the definition of insufficient weight loss (IWL), less than 50% excess weight loss (%EWL) at 1-2 years post-surgery, or weight regain (WR) of more than 25-30% from the lowest post-surgery weight appropriate.

It's imperative to address the need for future research to rectify controversies, fill in literature gaps, and provide valuable insights into standardizing weight outcomes post-BS. Moreover, long-term prospective studies with sufficient sample sizes and adequate follow-up duration can substantiate comprehensive and reliable data on weight outcomes post-BS and pave pathways for future guidelines in defining insufficient weight loss and weight regain.

Conflict of interest

The authors declare that there is no conflict of interest.

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