

Dietary adherence in recovery after bariatric surgery: a narrative review

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Abstract

Bariatric surgery is the most successful method of weight loss in severely obese patients. Its long-term success seems to depend on several factors, such as poor dietary tolerance and lifestyle after surgery. This review was conducted on studies investigating the role of adherence to an appropriate diet in weight loss maintenance after bariatric surgery. The search was performed on PubMed and Web of Science databases, including studies from 1999 to 2020. Two hundred and ten publications were screened, but only 11 included factors involved in dietary adherence and met the search criteria. The findings showed that weight loss and maintenance vary considerably between patients in the post-bariatric phase. Good dietary adherence exerts positive effects on short-and long-term success of bariatric surgery; similarly, psychological support is able to determine

psychological counseling, and regular follow-ups will allow monitoring of the patient's eating behavior and contribute to weight loss maintenance.

1 Introduction

Obesity is currently one of the most significant health problems in the society [1]. Obesity is a complex condition, one with serious social and psychological dimensions, that affects virtually all age and socioeconomic groups and threatens to overwhelm both developed and developing countries. There were an estimated 200 million obese adults worldwide and another 18 million under-five children classified as overweight. As of 2000, the number of obese adults has increased to over 300 million. Contrary to conventional wisdom, the obesity epidemic is not restricted to industrialized societies; in developing countries, it is estimated that over 115 million people suffer from obesity-related problems. Generally,

although men may have higher rates of overweight, women have higher rates of obesity. For both, obesity poses a major risk for serious diet-related non-communicable diseases, including diabetes mellitus, cardiovascular disease, hypertension and stroke, and certain forms of cancer [2-5]. Obesity is also associated with a significantly increased risk of impaired quality of life [6].

There are few effective weight-control options for stronger obesity. Comprehensive behavior modification programs, as well as pharmacological treatments, typically produce an 8% to 10% reduction in initial weight [7], and the weight regain is often significant. Every legitimate nutrition expert, whether a popular diet guru or a representative of the medical nutrition establishment, agrees that there are some fundamental principles of healthy weight loss that apply to everyone. No matter how much they are disguised, these principles are at the core of every good diet plan, be it a dietician's plan or a bestseller's. And nobody achieves permanent weight loss and optimal health without obeying these principles, consciously or unconsciously. While there appears to be no single right way to eat for health and weight loss (on the level of details), you need to be aware

of the basic principles. [8,9]. These modest outcomes may improve the health and psychosocial status of those with mild to moderate obesity, but exert little effect on the health and well-being of those with extreme obesity [10]. Thus, bariatric surgery represents the most successful long-term treatment for severe obesity and its related comorbidities, particularly diabetes [11].

Bariatric surgery is a surgical procedure performed to facilitate substantial weight loss by reducing the size of the stomach and/or limiting absorption in the small intestine [12]. It has become a more popular treatment option for those with extreme obesity or those with a BMI of 35 kg/m² in the presence of significant obesity-related comorbidities [10]. Although bariatric surgery is an effective method for weight loss, the results obtained are not always as expected [1]. Its long-term success seems to depend to some degree on the patient's ability to adhere to a complex set of behaviors, exercise, and vitamin recommendations [6]. Indeed, it has been seen that poor dietary tolerance and lifestyle after surgery can have a considerable effect on weight changes and quality of life. For this reason, it is important that the post-operative period must be accompanied by a major change in lifestyle, including controlled nutrition and

regular physical activity^[13]. Adoption of right behaviors after surgery has been implicated as a possible determinant not only of the weight loss achieved, but also of the ability to maintain it in the medium and long term. Consequently, it may affect the quality of life^[1]. Success following bariatric surgery is determined by both weight lost and improvement in obesity-related comorbidities. Most surgical studies report outcome as percent excess weight loss (excess weight = [preoperative weight – ideal weight]). The lap band typically produces 40% to 60% evaporation weight loss (EWL) over 2 to 3 years but has a 20% failure rate. The gastric bypass has long-term data showing a 50% loss of excess body weight maintained after 14 years. Most current laparoscopic literature shows up to 5-year excess weight loss in the 60% to 80% range. There is typically some recidivism after 2 years and it has a 10% failure rate. The biliopancreatic diversion is the most effective weight loss procedure and results in the loss of 80% excess weight maintained over the long term. The sleeve gastrectomy is currently being studied for long-term success and so far comes close to the gastric bypass in terms of weight loss efficacy^[14-16].

Indeed, published studies have shown that many bariatric patients fail to lose their optimal weight or regain significant weight after surgery^[13]. Beyond the complications that can be linked to bariatric surgery, several parameters such as lifestyle (i.e., diet, physical activity, sedentary behaviors, and smoking) can influence the outcome of post-bariatric surgery^[1]. Some investigators have suggested that preoperative psychosocial status is associated with postoperative outcomes^[17-20].

In this study, the aim was to determine how the insistence on strict adherence to an appropriate diet can contribute greatly to weight loss and its maintenance after bariatric surgery.

2 Methods

2.1 Search strategy

A narrative review that used a systematic search was conducted specifically on post-bariatric surgical patients. Notably, studies were identified by searching the PubMed and Web of Science databases, filtering for articles published from April 1999 (the year of the first published article on this topic) to February 2020. The study combined the following terms: ("bariatric surgery" [MeSH Terms] OR

("bariatric"[All Fields] AND "surgery"[All Fields]) OR "bariatric surgery"[All Fields]) AND ("diet"[MeSH Terms] OR "diet"[All Fields] OR "dietary"[All Fields]) AND adherence [All Fields]). All these terms were used in both search engines.

2.2 Study selection and inclusion / exclusion criteria

After duplicates and not English texts were removed, all articles were evaluated based on title, abstract, and text. The selected studies aimed to determine how faithful adherence to a diet could positively affect the outcome of post-bariatric surgery, according to the following inclusion criteria:

1. Published peer-reviewed research
2. The sample population included post-bariatric patients
3. Studies specifically assessed how dietary adherence contribute to the positive outcomes

Case studies, dissertations, commentaries, letters or editorials, and systematic, integrative, and narrative reviews were excluded.

3. Results

Of the 210 identified studies, only 11 met the inclusion criteria (Fig. 1) and investigated bariatric surgery and dietary adherence in obese patients. All studies analyzed the outcome of post-bariatric surgery, with an emphasis on the contribution of dietary adherence and/or other relevant factors. For the purposes of this review, studies were subdivided according to the constructs examined and the tools used. The objective, sample, test, and results are listed in Table 1. In order to maintain weight loss after bariatric surgery, several studies and research relays the need to put together different recommendations.

3.1 The contribution of Dietary Adherence

Most studies agree that good dietary adherence exerts positive effects on the short-and long-term success of bariatric surgery. For example, Sarwer et al. ^[21] suggested the importance of pre- and/or postoperative dietary counseling, combined with the intake of micronutrients after bariatric surgery, could improve dietary adherence and appropriate eating behavior, and Endevelt et al. ^[22]

demonstrated that structured nutritional counseling after bariatric intervention can help to achieve clinically significant weight reduction. Dietary recommendations are essential for improving adherence. Maghrabi et al. [2] assessed the effect of nutritional education on nutritional knowledge related to post-bariatric dietary recommendations on Saudi bariatric patients and the impact of time on their knowledge retention following education. International dietary guidelines aim to reduce risks of all-cause mortality, cardiovascular disease (CVD), and fatal CVD often associated with poor dietary habits. However, most studies have examined associations with individual nutrients, foods, or dietary patterns, as opposed to quantifying the pooled health effects of adherence to international dietary recommendations [23-25]. Hence, nutritional education improved post-bariatric nutritional knowledge in bariatric patients in the short term; however, this nutritional knowledge was not retained after one–three months. These findings demonstrate that nutritional education is important before surgery, but continuous follow-up after surgery is necessary to improve the long-term adherence of patients to dietary recommendations. The most important aspects in the medical

management of the bariatric patient refer to nutritional management. Before BS, the nutritional status should be checked and pre-operative weight loss may be attempted. Very low calories diet (VLCD) and very low calories ketogenic diets (VLCKD) are frequently prescribed in the last months before surgery. After the procedure, nutritional counselling is important in order to facilitate the adaptation of the eating habits to the new gastro-intestinal physiology. Nutritional deficits may arise according to the type of bariatric procedure and they should be prevented and eventually treated. Finally, specific nutritional problems, like dumping syndrome and reactive hypoglycaemia, can occur and should be managed largely by nutritional manipulation. In this paper, a brief overview of the nutritional management of the bariatric patients will be provided, moving from pre-operative to post-operative phase [26-28].

Adler et al. [29] also underlined the relevance of nutritional counseling. They evaluated the impact of self-reported poor dietary adherence following bariatric surgery on less successful weight loss results. In particular, the study calculated the correlation between dietary adherence and six typical diet-related behaviors and found that all six misfit behaviors (grazing,

brainless eating, loss of food control, eating after dinner, eating off plan, eating more) were highly correlated with dietary adherence. Therefore, these six maladaptive behaviors represent a significant part of the poor dietary adherence of post-bariatric patients.

It is important to note that adherence to a healthy dietary pattern, such as the Mediterranean diet, seems to mediate the effects of surgery on weight loss more than physical activity^[1].

3.2 Psychological interventions and predictors

Another significant aspect is the role of psychological intervention. Peacock et al. [30] found that not only education on how to modify different aspects of one's lifestyle (including exercise and eating behavior) is important, but it is also essential that there is greater integration of behavioral and psychological services after surgery to help patients adopt and maintain regular physical activity. For long-term success of bariatric surgery, the intervention should therefore go hand in hand with non-surgical interventions to make the ground even in the psychosocial field. It has been seen, in fact, that a better

quality of life, good psychosocial functioning and adherence to behavioral recommendations, leads to greater weight loss^[31]. Moreover, David et al.^[12] studied the effects of adapted motivation on dietary adherence. The goal of motivational interviewing is to improve adherence to behavioral change recommendations. To accomplish this goal, motivational interviewing helps patients explore and resolve their ambivalence about changes^[32]. Based on the results of David et al.^[12], AMI intervention is recommended because it offers bariatric patients the possibility of improvement in terms of readiness, confidence, and self-efficacy in eating changes and behaviors immediately after bariatric intervention.

Analyzing the role of cognitive functioning, Spitznagel et al.^[33] found that cognitive dysfunction could determine a higher body mass index (BMI) and lower percent weight loss. In particular, the authors demonstrated that recognition memory, working memory, and generativity were more strongly linked to weight loss.

Some variables could be considered predictors of adherence to behavior recommendations and weight loss.

Identifying the predictors may help improve outcomes after bariatric surgery, Bergh et al. [34] found several preoperative psychological predictors linked to postoperative adherence and dietary and physical activity recommendations. In contrast, these predictors were not associated with weight loss. The authors recommended interventions aimed at psychological factors that facilitate changes during the postoperative phase. Some bariatric patients fail to lose their optimal weight or regain significant weight after surgery. Patient expectations have been shown to be a major predictor of outcomes. Fulfilled expectations have been linked to increased patient satisfaction and rehabilitation adherence. Expectations may be influenced by a variety of factors, including patient characteristics, preoperative function, or disease characteristics [35]. The reason for this failure may be the difficulty in adhering to the postoperative diet [17]. The study found that many patients showing bad habits before surgery and without further help to change these behaviors can regain weight. Therefore, convenient access to registered dietitian nutritionists (RDNs) has been helpful. Furthermore, it is important that bariatric facilities have staff who are well

trained in specific nutritional barriers to provide useful information.

4. Discussion

The purpose of this review was to summarize the literature on how strict adherence to an appropriate diet can contribute greatly to weight loss and its maintenance after bariatric surgery. The findings showed that the most relevant predictors of weight loss were postoperative eating behavior, adherence to diet, and the presence of adequate psychological intervention, more than physical activity recommendations. Studies agree that weight loss and weight loss maintenance vary considerably between patients. This variability is partly due to differences in adherence to dietary and/or behavioral recommendations, as physiological changes obtained with surgery alone are not sufficient to determine a positive long-term outcome [36].

Bariatric surgery exerts positive effects on the majority of severely obese patients; however, a significant minority have no long-term effects (20 %–30%) [37]. The failure to achieve sufficient postoperative weight loss seems to be due not only to the

quality and frequency of follow-up, but also to some internal features of the patient. A better understanding of these factors in the preoperative phase may help identify patients at risk of suboptimal outcomes ^[29]. Identifying poorly adapted post-bariatric behaviors underlying poor dietary adherence is necessary to develop or adapt effective interventions to support optimal postoperative weight loss produce positive benefits.

Introducing psychosocial interventions can help patients adhere to dietary guidelines and improve their eating behavior after surgery ^[38]. People often eat as a means of dealing with emotional difficulties, and receiving psychological support can act positively ^[39]. Numerous behavioral and psychosocial factors can make adherence to the recommended diet and lifestyle challenging, but little psychological or behavioral treatment beyond support groups is available as standard of care after surgery. Psychiatric medication use is higher in bariatric surgery patients than in the general population and two-thirds of patients have a lifetime diagnosis of at least one psychiatric disorder. Modifiable psychosocial and behavioral factors, including depression, binge eating, low levels of social support and high life stress may contribute to difficulties with

postoperative adherence, and in turn, to the occurrence of weight regain ^[40-42]. In addition, support should be provided at the beginning, during, and after surgical intervention. It is well known that bariatric surgery programs could benefit from binge eating treatment prior to surgery, and in one study, participants provided positive qualitative feedback ^[43-46]. However, the initial hypothesis was that psychological support is effective even in the absence of psychopathology. From this review, it is possible to assume that this support could offer improvements in readiness for change and confidence in the ability to change. Indeed, a psychological intervention may act on perceived self-efficacy to resist eating too much in situations of temptation and to adhere to the postoperative reference guide. Smith demonstrated that introducing a standard longitudinal psychological treatment with a motivational component could significantly improve adherence to program recommendations and glycemic control ^[47]. Psychological interventions may be effective in improving adherence after bariatric surgery; however, there is limited research on patients' willingness to engage with psychological aftercare ^[46,47].

The longitudinal nutritional and psychological care of these patients is

fundamental because it allows the intervention of old eating habits and models that need to be changed permanently to lose weight and keep it off [39]. This nutritional and psychological care must be provided to patients before the intervention and with continuous follow-up [2]. Further studies should investigate the effectiveness of psychological interventions in improving adherence to nutritional guidelines.

Studies have found the effect of psychopathology, such as depression and eating disorders, on weight loss, finding that these are the major negative predictors of weight loss results [48,49]. Eating is probably a way to deal with emotional difficulties [50]. Moreover, cognitive functioning seems to have an impact on the daily functioning of postoperative patients. Spitznagel [33] hypothesized that not executive functioning could have an impact on the ability to solve problems and develop new alternatives if the previous diet or physical activity choices become less feasible or inconsistent with the post-operative lifestyle recommendations. In contrast, good cognitive functioning can lead to a positive outcome.

5 Conclusions

In summary, before the intervention, it is fundamental to accompany the patients on a psychological level, paying particular attention to the factors that will facilitate changes in behavior during the postoperative phase. Afterwards, it will be decisive to offer patients dietary counseling for nutritional education through a regular follow-up that will allow the monitoring of their eating behavior.

After the intervention, in addition to continuing the dietary counseling with a regular follow-up that will allow patients to access RDN services, to check that they do not have maladaptive eating behaviors and submit them for example (possibly) to AMI intervention, it is essential that patients can benefit from physical activity model services that help them both from a behavioral and psychological point of view. Finally, knowledge of cognitive functioning is important because it is a significant indicator of weight monitoring.

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References

1. Contreras AG, Sanjaume AB, Becerra-Tomás N, Salas-Salvadó J. Adherence to Mediterranean Diet or Physical Activity After Bariatric Surgery and Its Effects on Weight Loss, Quality of Life, and Food Tolerance. *Obesity surgery* 2020;30(2):687-696.2
2. Maghrabi AA, Abumunaser A, Dakhakhni B, et al. Nutritional Education for Patients Undergoing Bariatric Surgery Improves Knowledge of Post-Bariatric Dietary Recommendations. *Health Sciences* 2019;8(9):82-88.
3. Verma M, Das M, Sharma P, et al. Epidemiology of overweight and obesity in Indian adults-A secondary data analysis of the National Family Health Surveys. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews* 2021; 11-15(4):102166.
4. Kapoor N, Kalra S, Kota S, Das S, Jiwanmall S, Sahay R. The SECURE model: A comprehensive approach for obesity management. *J Pak Med Assoc.* 2020;70(8):1468-1469.
5. Mathur P, Kulothungan V, Leburu S, et al. Baseline risk factor prevalence among adolescents aged 15-17 years old: findings from National Non-communicable Disease Monitoring Survey (NNMS) of India. *BMJ Open.* 2021; 29;11(6):e044066.
6. Hood MM Corsica J, Bradley L, et al. Managing severe obesity: understanding and improving treatment adherence in bariatric surgery. *J Behav Med.* 2016;39(6):1092-1103.
7. Wadden TA, Butryn ML. Behavioral treatment of obesity. *Endocrinol Metab Clin North Am.* 2003;32:981-1003.
8. Buoncristiano M, Williams J, Simmonds P, et al. Socioeconomic inequalities in overweight and obesity among 6- to 9-year-old children in 24 countries from the World Health Organization European region. *Obes Rev.* 2021; 28:e13213.
9. Williams DR, Costa MV, Odunlami AO, Mohammed SA. Moving upstream: how interventions that address the social determinants of health can improve health and reduce disparities. *J Public Health Manag Pract.* 2008;14(Suppl):S8-S17.
10. Sarwer DB, Wadden TA, Fabricatore AN. Psychosocial and behavioral aspects of bariatric surgery. *Obes Res* 2005;13:639-48.
11. Nance K, Acevedo MB, Pepino MY. Changes in taste function and ingestive behavior following bariatric surgery. *Appetite* 2019;104423.
12. David LA, Sockalingam S, Wnuk, S, et al. A pilot randomized controlled trial examining the feasibility, acceptability, and efficacy of Adapted Motivational Interviewing for post-operative bariatric surgery patients. *Eating behaviors* 2016; 22:87-92.
13. Favretti F, O'Brien PE, Dixon JB. Patient management after LAPBAND placement. *Am J Surg* 2002;184:38S-41S.
14. Samaan JS, Zhao J, Qian E, Hernandez A, Toubat O, Alicuben ET, Malik Y, Sandhu K, Dobrowolsky A, Samakar K. Preoperative Weight Loss as a Predictor of Bariatric Surgery Postoperative Weight Loss and Complications. *J Gastrointest Surg.* 2021 18. doi: 10.1007/s11605-021-05055-5.
15. Afshin A, Forouzanfar MH, Reitsma MB, Sur P, Estep K, Lee A, et al. Health Effects of Overweight and Obesity in 195 Countries over 25 Years. *N Engl J Med.* 2017; (1):13-27.
16. Einarson TR, Acs A, Ludwig C, Panton UH. Prevalence of cardiovascular disease in type 2 diabetes: a systematic literature review of scientific evidence from across the world in 2007-2017. *Cardiovasc Diabetol.* 2018;17(1):83.

17. Peacock JC, Schmidt CE, Barry K. A qualitative analysis of post-operative nutritional barriers and useful dietary services reported by bariatric surgical patients. *Obesity surgery* 2016; 26(10):2331-2339.
18. Bocchieri LE, Meana M, Fisher BL. A review of psychosocial outcomes of surgery for morbid obesity. *J Psychosom Res* 2002;52:155-65.
19. Herpertz S, Kielmann R, Wolf AM, et al. Does obesity surgery improve psychosocial functioning? A systematic review. *Int J Obes Relat Metab Disord* 2003;27:1300-14.
20. Van Hout GC, van Oudheusden I, van Heck GL. Psychological profile of the morbidly obese. *Obes Surg* 2004;14:479-88.
21. Sarwer DB, Wadden TA, Moore RH, et al. Preoperative eating behavior, postoperative dietary adherence, and weight loss after gastric bypass surgery. *Surgery for Obesity and Related Diseases* 2008;4(5):640-646
22. Endevelt R, Ben-Assuli O, Klain E, et al. The role of dietician follow-up in the success of bariatric surgery. *Surgery for Obesity and Related Diseases* 2013;9(6):963-968.
23. Kebbe M, Gao M, Perez-Cornago A, Jebb SA, Piernas C. Adherence to international dietary recommendations in association with all-cause mortality and fatal and non-fatal cardiovascular disease risk: a prospective analysis of UK Biobank participants. *BMC Med.* 2021 Jun 23;19(1):134. doi: 10.1186/s12916-021-02011-7. PMID: 34158032; PMCID: PMC8220774.
24. Lu J, Wang Y, Hou L, Zuo Z, Zhang N, Wei A. Multimorbidity patterns in old adults and their associated multi-layered factors: a cross-sectional study. *BMC Geriatr.* 2021 19;21(1):372.
25. Melendez-Araújo MS, Lemos KGE, Arruda SLM, Dutra ES, de Carvalho KMB. Weight Status of Brazilian's Mother-Son Dyad after Maternal Bariatric Surgery. *Obes Surg.* 2020 Sep;30(9):3508-3513.
26. Dolin CD, Chervenak J, Pivo S, Ude Welcome A, Kominiarek MA. Association between time interval from bariatric surgery to pregnancy and maternal weight outcomes. *J Matern Fetal Neonatal Med.* 2019; 13:1-7.
27. Voils CI, Adler R, Strawbridge E, Grubber J, Allen KD, Olsen MK, McVay MA, Raghavan S, Raffa SD, Funk LM. Early-phase study of a telephone-based intervention to reduce weight regain among bariatric surgery patients. *Health Psychol.* 2020;39(5):391-402.
28. Bettini S, Belligoli A, Fabris R. et al. Diet approach before and after bariatric surgery. *Reviews in Endocrine and Metabolic Disorders,* 2020; 21(3), 297-306.
29. Adler S, Fowler N, Robinson AH, et al. Correlates of dietary adherence and maladaptive eating patterns following roux-en-Y bariatric surgery. *Obesity surgery* 2018;28(4):1130-1135.
30. Peacock JC, Zizzi SJ. An assessment of patient behavioral requirements pre-and post-surgery at accredited weight loss surgical centers. *Obesity surgery* 2011;21(12):1950-1957.
31. de Jong MM, Hinnen C. Bariatric surgery in young adults: a multicenter study into weight loss, dietary adherence, and quality of life. *Surgery for Obesity and Related Diseases* 2017;13(7):1204-1210.
32. Wender EH. Interviewing: a critical skill. In *Developmental-Behavioral Pediatrics* WB Saunders; 2009,747-755.
33. Spitznagel MB, Alosco M, Galioto R, et al. The role of cognitive function in postoperative weight loss outcomes: 36-month follow-up. *Obesity surgery* 2014;24(7):1078-1084.
34. Bergh I, Kvalem IL, Rissstad H, et al. Preoperative predictors of adherence to dietary and physical activity recommendations and weight loss one

- year after surgery. *Surgery for Obesity and Related Diseases* 2016;12(4):910-918.
35. Toonstra JL, Howell D, English RA, Lattermann C, Mattacola CG. The Relationship Between Patient Expectations and Functional Outcomes in Patients Undergoing Cartilage Repair of the Knee: A Mixed Methods Study. *J Sport Rehabil.* 2021; 28:1-9.
 36. Konttinen H, Peltonen M, Sjöström L, Carlsson, L., Karlsson, et al. Psychological aspects of eating behavior as predictors of 10-y weight changes after surgical and conventional treatment of severe obesity: results from the Swedish Obese Subjects intervention study. *Am J Clin Nutr* 2015;101(1):16-24.
 37. Sjöström L., Narbro K., Sjöström CD, et al. Effects of bariatric surgery on mortality in Swedish obese subjects for the Swedish obese subjects study. *N. Engl J. Med.* 2007;357:741-52
 38. Nijamkin MP, Campa A, Nijamkin SS, et al. Comprehensive behavioral/motivational nutrition education improves depressive symptoms following bariatric surgery: A randomized, controlled trial of obese Hispanic americans. *Journal of Nutrition Education and Behavior* 2016;45(6):620–626.
 39. Whiteside U, Chen E, Neighbors C, et al. Difficulties regulating emotions: Do binge eaters have fewer strategies to modulate and tolerate negative affect? *Eating Behaviors* 2007;8(2):162–169.
 40. Lent MR, Campbell LK, Kelly MC, Lawson JL, Murakami JM, Gorrell S, Wood GC, Yohn MM, Ranck S, Petrick AT, Cunningham K, LaMotte ME, Still CD. The feasibility of a behavioral group intervention after weight-loss surgery: A randomized pilot trial. *PLoS One.* 2019; 21;14(10):e0223885.
 41. LeBlanc EL, Patnode CD, Webber EM, Redmond N, Rushkin M, O'Connor EA. Behavioral and Pharmacotherapy Weight Loss Interventions to Prevent Obesity-Related Morbidity and Mortality in Adults: An Updated Systematic Review for the U.S. Preventive Services Task Force [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (US); 2018 Sep. Report No.: 18-05239-EF-1. PMID: 30354042.
 42. Cornejo-Pareja I, Molina-Vega M, Gómez-Pérez AM, Damas-Fuentes M, Tinahones FJ. Factors Related to Weight Loss Maintenance in the Medium-Long Term after Bariatric Surgery: A Review. *J Clin Med.* 2021 Apr 16;10(8):1739. doi: 10.3390/jcm10081739. PMID: 33923789; PMCID: PMC8073104.
 43. Pepino, M.Y.; Bradley, D.; Eagon, J.C.; Sullivan, S.; Abumrad, N.A.; Klein, S. Changes in taste perception and eating behavior after bariatric surgery-induced weight loss in women. *Obesity* 2014, 22, E13–E20
 44. Forman, E.M.; Butryn, M.L.; Manasse, S.M.; Crosby, R.D.; Goldstein, S.P.; Wyckoff, E.P.; Thomas, J.G. Acceptance-based versus standard behavioral treatment for obesity: Results from the mind your health randomized controlled trial. *Obesity (Silver Spring)* 2016, 24, 2050–2056.
 45. Vatier, C.; Henegar, C.; Ciangura, C.; Poitou-Bernert, C.; Bouillot, J.-L.; Basdevant, A.; Oppert, J.M. Dynamic relations between sedentary behavior, physical activity, and body composition after bariatric surgery. *Obes. Surg.* 2012, 22, 1251–1256.
 46. Cassin SE, Sockalingam S, Wnuk S, et al. Cognitive behavioral therapy for bariatric surgery patients: Preliminary evidence for feasibility, acceptability, and effectiveness. *Cognitive and Behavioral Practice* 2013;20(4):529-543.
 47. Smith DE, Heckemeyer CM, Kratt PP, et al. Motivational interviewing to improve adherence to a behavioral weight control program for older obese women with NIDDM. *Diabetes Care* 1997;20(1):52-54.
 48. Kulick D, Hark L, Deen, D. The bariatric surgery patient: a growing role for registered dietitians. *J Am Diet Assoc* 2010;110:593-9.

49. Kulick D, Hark L, Deen, D. The bariatric surgery patient: a growing role for registered dietitians. *J Am Diet Assoc* 2010;110:593-9.
50. Meany G, Conceicao E, Mitchell JE. Binge eating, binge eating disorder, and loss of control eating: Effects on weight outcomes after bariatric surgery. *European Eating Disorders Review* 2014;22(2):87–91.

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