World Journal of Pharmaceutical Science and Research
www.wjpsronline.com
Research Article
ISSN: 2583-6579
SJIF Impact Factor: 3.454
Year - 2024
Volume: 3; Issue: 3
Page: 75-87

EXPLORING NEW APPROACHES IN WEIGHT LOSS THROUGH A SYSTEMATIC STUDY

S. B. Fatima* and Hna Alnhair

Department of Clinical Nutrition, University of Hail, Hail, KSA.

Article Received: 15 April 2024 | | Article Revised: 08 May 2024 | | Article Accepted: 30 May 2024

Corresponding Author: S. B. Fatima
Department of Clinical Nutrition, University of Hail, Hail, KSA.
DOI: https://doi.org/10.5281/zenodo.11424387

ABSTRACT

Background: The identification of factors associated with weight loss maintenance can enhance our understanding for the behaviors and prerequisites that are crucial in achieving and sustaining a lowered body weight. **Objective**: The aim of this study was to explore the weight-loss experiences of dieters not aligned to research, to provide a rich, detailed account of how these people experienced and accommodated their weight loss efforts, in real-life contexts. **Methods:** Literature searches were conducted in PubMed/Medline and PsycINFO/OVID for peer reviewed manuscripts published in English from 2000 onwards. We included studies based on systematic literature searches that included at least one primary intervention evaluation comprising of a non-surgical or a surgical intervention. Citations retrieved were selected to illustrate the points. **Discussion:** According to our review, successful weight maintenance is associated with more initial weight loss. Lifestyle strategies to modify eating behavior is indicated in helping patients modify their patterns of eating. Physical activity is particularly important in helping patients maintain a weight loss once achieved and is less valuable for weight loss itself. Food intake is controlled through many different mechanisms, but only a few drugs have been developed that tap these mechanisms. Surgical approaches provide the most dramatic weight loss and have been demonstrated to reduce long-term mortality. These promising results should stimulate the adoption of multidisciplinary approaches based on lifestyle modification for the management of obesity. **Conclusions:** Evidence from this systematic review suggests that long term weight loss through changes in eating and physical activity is possible. Weight loss can be achieved by many methods, but the recent surgical procedures appear to be the most durable.

KEYWORDS: Weight loss, Bariatric, Non-surgical.

INTRODUCTION

Obesity is one of the greatest causes of preventable morbidity and mortality worldwide, with weight loss associated with reductions in risk of morbidity and mortality.[1] Evidence from systematic reviews suggests that long term weight loss through changes in eating and physical activity is possible, even in adults who have already acquired obesity related illness.[2]

Weight loss is difficult to achieve and maintaining the lost weight is an even greater challenge. Wardle *et.al* reported that 28% of adults in the United Kingdom claimed to be actively trying to lose weight.[3] It is a complicated problem, where physical, environmental, and behavioral factors disrupt and assist dieters in their pursuit of negative energy balance. Evidence indicates that weight loss leads to adaptations that increase appetite the desire to eat and preoccupations with food cravings and reduced energy cost of activity.[4]

In a population survey based in the United States, Nicklas *et.al* found that that 63% of obese participants had attempted to lose weight over the past 12 months, of whom 40% had succeeded in losing ≥5% of their initial weight and 20% had succeeded in losing ≥10%.(?) Weight loss is consequently multifaceted, and often tough to accomplish, explaining why over 80 % of dieters get back lost weight.[5]

Small proportions of individuals do achieve and maintain weight loss however, and research has sought to identify factors that differentiate these individuals from those who are unable to achieve their weight-loss goals.[5] Successful dieters modify their lifestyles to achieve early successes ; they maintain and remodel their newfound behaviors over time[6]; they possess social support mechanisms and are attentive to threats to their weight status.[7] Notably, fruitful dieters view weight loss as a lifelong obligation[1] people who have maintained.

Despite a growing body of evidence that unpicks factors associated with successful weight management, much of the literature has been undertaken using quantitative methods, which might not fully reveal the complexity of the experience.[5] The qualitative study of weight management is sensed to be in its beginning and profound comprehensions into the weight-management challenge have initiated to appear in the literature.[8]

Kevin Hall, a federal research scientist, upon following the participants of a weight-loss show for six years found that not only did they have slower resting body metabolism, but they also had lower levels of the appetite suppressing hormone-Leptin. The change in body chemistry caused the former weight-loss contenders to be perpetually hungry. Nonetheless, now with slower resting body metabolism, they also required far fewer calories to maintain their goal weight than a regular person their size. Furthermore, Hall learned that the body works very hard to get back to its original weight before the weight was lost. This is not that astonishing as the body has many mechanisms to preserve homeostasis. Alas, sustaining weight eventually proved to be a losing battle for the participants. Not only did they acquire the weight back, but some now weigh even more.[9]

The identification of factors associated with weight loss maintenance can enhance our understanding the behaviors and prerequisites that are crucial in sustaining a lowered body weight. Abundant effective weight loss programs are now accessible to facilitate people not only to drop but also to maintain weight.

METHODOLOGY

Study Design In this paper we have reviewed the literature on weight loss methods, its maintenance and weight regain. A search was conducted from the following databases: PUBMED central Abstracts, Springer Links, EMBASE, MEDLINE, Wiley, and Web of Science.

Review Inclusion Criteria Studies mentioning successful weight loss and subsequent maintenance for a minimum six months to one year was the criteria used for inclusion. We included around 24 studies based on systematic literature

searches published in English from 2000 year onwards.

DISCUSSION

Demarcations of Weight loss Maintainers

The criteria for weight loss used in this study was the one proposed by Wing and Hill[10] that successful weight loss maintainers be defined as "individuals who have intentionally lost at least 10% of their body weight and kept it off at least one year". Several aspects of this definition should be noted. First, the definition requires that the weight loss be intentional. Numerous recent studies indicate that unintentional weight loss occurs quite frequently and may have different causes and consequences than intentional weight loss. Thus, it is important to include intentionality in the definition. Although a 10% weight loss may not return an obese to a non-obese state, the health impact of a 10% weight loss is well documented. Finally, the 1-year duration criterion was proposed in keeping with the Institute of Medicine criteria.[11]

To facilitate better comprehension, we have classified the researched weight loss approaches into methods arranging from latest to the least and described these under the following sections.

Approach No.1 – Advancing Elements of a lifestyle program

Current behavioral packages usually include keeping food diaries and activity records, controlling the stimuli that activate eating, slowing down the rate of eating, setting goals, behavioral contracting and reinforcement, nutrition education, meal planning, modification of physical activity, social support, cognitive restructuring, and problem solving.[12] Behavioral programs can be successful when administered individually, as was done with the Diabetes Prevention Program, where weight loss averaged 7% below baseline by 6 months with only a slow gradual regain over the ensuing three years.[13] It can also be done using groups, which provide a more economical setting, because a single therapist can treat up to 15 or more participants.[14]

A recent review of long-term effectiveness of lifestyle and behavioral weight-loss interventions by Norris and colleagues found 22 studies that examined weight loss in this group of patients with some studies lasting up to 5 yr.[15] Compared with weight loss among more than 500 diabetics receiving usual care, behavioral strategies produced an added −1.7 kg of weight loss. If physical activity and behavioral strategies were combined with a Very Low Calorie Diet, weight loss was −3.0 kg more than in the VLCD comparison groups. With more intense physical activity added on top of behavioral and dietary advice, added weight loss was −3.9 kg.

Norris and colleagues found that in four trials, adding behavioral therapy to diet increased the weight loss after 12 months by −7.67 kg. The authors conclude that weight-loss strategies involving behavior change, diet, and physical activity were associated with small between-group improvements in weight loss for diabetics. In a meta-analysis.[16]

Approach No.2- Applying strength *vs.* endurance

Increasing physical activity was a key element in success for members of the National Weight Control Registry.[17] In this group of more than 4000 individuals who had lost at least 13.6 kg (30 pounds) and kept it off for at least 1 yr, increasing physical activity was an important element in success. These individuals had lost an average of 33 kg and maintained it for an average of 5.7 yr. Women in the Registry reported expending 2545 kcal/wk and men 3293 kcal/wk. This would be equivalent to about 1 h/d moderate-intensity activity, such as brisk walking.

Two kinds of exercise, endurance, and strength training have been used to treat obesity. Endurance exercises, such as walking briskly, jogging, running, or riding a bicycle, are useful for increasing cardiovascular fitness, whereas weightlifting strengthens individual muscle groups. Step counters that can be attached to the belt are a useful way to monitor walking. Current recommendations are to walk 30–90 min/d for 5 d/wk.[18] In a trial of three dose levels of exercise, including the current level of 8 kcal/kg, Church *et al.*[19] showed a dose-dependent increase in cardiorespiratory performance across a range of exercise levels averaging 72, 136, and 192 min/wk but with no differences in body weight.

One of the best trials of exercise and diet is shown in a year-long study by Wood and colleagues[20], who reported a decrease of −7.2 kg in body weight in the group receiving the dietary prescription and a decrease of −4.0 kg in body weight in the group participating in the exercise intervention. There was a decrease in low-density lipoprotein-cholesterol and triglycerides and an increase in high-density lipoprotein (HDL)-cholesterol. These effects occurred in both men and women. In a metaanalysis of changes in lipids with diet and exercise, Dattilo and colleagues[21] found that for each decrease of 1 kg in body weight there was a decrease of −0.75 mg/dl in total cholesterol, a decrease of 0.6 mg/dl in triglycerides, and a change in HDL-cholesterol that depended on whether body weight was stable or body weight was still declining. If weight was stable, HDL-cholesterol increased +0.35 mg/dl, but if weight loss was still occurring, HDL- cholesterol was −0.25 mg/dl lower.

Approach No.3- Use of prescriptive approved medications

A) Sibutramine

Sibutramine is a serotonin-norepinephrine reuptake inhibitor. In a 6-month trial where 1047 patients were randomized to placebo or doses of sibutramine ranging from 1–30 mg/d, there was a clear dose-response effect.[22] Longer trials with sibutramine have been conducted in uncomplicated obese patients, in patients with hypertension, in diabetics, and in children.[23] In a large 12-month-long multicenter trial with 498 adolescents ages 12–16 yr, the mean absolute change in BMI was −2.9 kg/m^2 (−8.2%) in the sibutramine group compared with −0.3 kg/m^2(−0.8%) in the placebo group ($P <$ 0.001).[23] Sibutramine has also been studied as part of a behavioral weight-loss program.

Safety*:* Sibutramine increases blood pressure levels in normotensive patients or blunts the decrease that might have occurred with weight loss. Systolic and diastolic blood pressure levels increased an average of +0.8 mm Hg and +0.6 mm Hg, and pulse increased approximately 4–5 beats/min.[22] Caution should be used when combining sibutramine with other drugs that may increase blood pressure levels. Sibutramine is contraindicated in patients with a history of coronary artery disease, congestive heart failure, cardiac arrhythmias, or stroke. Sibutramine should not be used with selective serotonin reuptake inhibitors or monoamine oxidase inhibitors, and there should be a 2-wk interval between terminating monoamine oxidase inhibitors and beginning sibutramine.

B) Sympathomimetic drugs

The sympathomimetic drugs, benzphetamine, diethylpropion, phendimetrazine, and phentermine, are grouped together because they act like norepinephrine and were tested before 1975. One of the longest of the clinical trials of drugs in this group lasted 36 wk and compared placebo treatment with continuous phentermine or intermittent phentermine.[22] Both continuous and intermittent phentermine therapy produced more weight loss than did placebo.

Safety of sympathomimetic drugs*:* Sympathomimetic drugs produce insomnia, dry mouth, asthenia, and constipation.

They are scheduled by the Drug Enforcement Agency, suggesting the U.S. government's view that they may be abused. Sympathomimetic drugs can also increase blood pressure.

C) Orlistat

Orlistat is a potent and selective inhibitor of pancreatic lipase that reduces intestinal digestion of fat. A number of long-term clinical trials with orlistat have been published using uncomplicated obese patients and obese patients with diabetes. A 4-yr double-blind, randomized, placebo- controlled trial with orlistat in 3304 overweight patients, 21% of whom had impaired glucose tolerance[22], achieved a weight loss during the first year of more than −11% below baseline in the orlistat-treated group compared with 6% below baseline in the placebo-treated group. Over the remaining 3 yr of the trial, there was a small regain in weight, such that by the end of 4 yr, the orlistat-treated patients were −6.9% below baseline, compared with −4.1% for those receiving placebo. There was a reduction of 37% in the conversion of patients from impaired glucose tolerance to diabetes. Orlistat has also been studied in adolescents. In 539 adolescents, orlistat 120 mg three times per day decreased BMI by −0.55 kg/m^2 in the drug-treated group compared with an increase of +0.31 kg/m^2 in the placebo group.[22]

Safety of orlistat- Orlistat is not absorbed to any significant degree, and its side effects are thus related to the blockade of triglyceride digestion in the intestine.[22] Fecal fat loss and related GI symptoms are common initially, but they subside as patients learn to use the drug. Orlistat can cause small but significant decreases in fat-soluble vitamins. Levels usually remain within the normal range, but a few patients may need vitamin supplementation. Because it is impossible to tell which patients need vitamins, it is wise to provide a multivitamin routinely with instructions to take it before bedtime. Orlistat does not seem to affect the absorption of other drugs, except acyclovir.

D) Combining orlistat and sibutramine

When orlistat was combined with sibutramine in a 4-month trial initiated at the end of a 12-month treatment period with sibutramine, there was no further weight loss.[22] Thus, we have no data that combining orlistat and sibutramine is beneficial.

Rimonabant

Rimonabant is approved and marketed in Europe, but at an Advisory Committee meeting to the FDA in June 2007, the vote was not to approve rimonabant in the United States. Rimonabant is a specific antagonist of the CB-1 receptor. Genetically engineered mice that lack the CB-1 receptor are lean and resistant to diet-induced obesity.

The results of four phase III trials of rimonabant for the treatment of obesity have been published[21,22]: two in uncomplicated obesity, and one each in patients with dyslipidemia and diabetes. A fifth study, called STRADIVARIUS, examined the effect of treatment for rimonabant on coronary artery plaque thickness in patients needing coronary angiography.[22] At the end of 18 months, there was no significant difference in the primary endpoint (percent atheroma volume) between groups (placebo *vs.* 20 mg/d rimonabant), but the secondary endpoint (total atheroma volume) showed significant improvement in the rimonabant group, raising the possibility that this drug may have benefits on the progression of coronary vascular disease.

Safety: There were significantly more psychiatric side effects with the higher dose of rimonabant in the first year of treatment, and three suicides were reported to the FDA during clinical trials. Because patients with depression were

excluded from the initial phase III studies, there is no information on how this drug works in depressed patients or those taking antidepressants.[23]

E) Combinations of drugs that produce weight loss

The first important clinical trial combining drugs that acted by separate mechanisms used phentermine and fenfluramine.[23] This trial showed a highly significant weight loss of nearly 15% below baseline with fewer side effects by using combination therapy. This combination became very popular, but due to reports of aortic valvular regurgitation associated with its use[22], fenfluramine was withdrawn from the market worldwide on September 15, 1997. Several other combinations of existing drugs are now under development, and the results are awaited with interest.

Approach No.4 - Secondary Weight Maintenance

Previous studies have focused on weight maintenance following weight loss, i.e. secondary weight maintenance (SWM). The long-term results of SWM have been rather modest and it has been suggested that preventing initial weight gain, i.e. primary weight maintenance (PWM), may be more successful.[24] Therefore, developing a prevention strategy focused on PWM, enabling normal weight or overweight individuals to maintain their weight, would be of great interest. The aim of this study was to identify attitudes, strategies, and behaviors that are predictive of PWM in different age, sex and BMI groups in Northern Sweden.

There is a general perception that almost no one succeeds in long-term maintenance of weight loss. However, research has shown that ≈20% of overweight individuals are successful at long-term weight loss when defined as losing at least 10% of initial body weight and maintaining the loss for at least 1 y. The National Weight Control Registry provides information about the strategies used by successful weight loss maintainers to achieve and maintain long-term weight loss. National Weight Control Registry members have lost an average of 33 kg and maintained the loss for more than 5 years.[25]

To maintain their weight loss, members report engaging in high levels of physical activity (≈1 h/d), eating a low-calorie, low-fat diet, eating breakfast regularly, self-monitoring weight, and maintaining a consistent eating pattern across weekdays and weekends. Moreover, weight loss maintenance may get easier over time; after individuals have successfully maintained their weight loss for 2–5 y, the chance of longer-term success greatly increases. Continued adherence to diet and exercise strategies, low levels of depression and disinhibition, and medical triggers for weight loss are also associated with long-term success. National Weight Control Registry members provide evidence that long-term weight loss maintenance is possible and help identify the specific approaches associated with long-term success.[25]

Approach No.5 – Applying Behavior Change Theories

i) ABT/SBT

A new approach to weight loss called Acceptance-Based Behavioral Treatment (ABT) helped people lose more weight and keep it off longer than those who received only Standard Behavioral Treatment (SBT) – a typical treatment plan encouraging reduced caloric intake and increased physical activity – according to a new randomized controlled clinical trial. Researchers studied the impact of the new ABT method, which ties the effort to a larger personal value beyond weight loss for its own sake, to help people adhere to diet and physical activity goals.[26]

The study, part of the well-regarded Mind Your Health trial, is one of the first of its kind. Results showed that participants who received ABT (which includes all behavioral skills taught in SBT) lost 13.3 percent of their initial weight at one year, compared to 9.8 percent weight loss at one year for participants who received SBT only. This difference represents a clinically significant 36 percent increase in weight lost for those in the ABT group.[26]

ii) Self-Efficacy/Dichotomous Behavior

Participants in this research described weight loss and weight-loss maintenance as an omnipresent and on-going challenge. Weight loss appeared to be punctuated with successes and failures, and problems and difficulties were balanced and combated with behaviors and strategies that fostered adherence. The thematic framework demonstrates that the issues identified: dichotomous thinking, environments, social pressures and weight centeredness, were experienced as barriers to the participants' weight-loss efforts, which at times stunted progress. By contrast, the facilitators: mindfulness, knowledge, exercise, structure, readiness to change, social support and self- monitoring, all assisted the participants' weight-loss efforts, antagonistically. Some of these facilitators were meta-cognitive strategies (mindfulness), cognitive behavioral techniques (self- monitoring), motivational states (readiness to change), and environmental (social support) and educational (knowledge) strategies that participants experienced, developed or adapted to achieve their goals.[27]

It is interesting to note that participants here articulated a mostly positive weight-loss experience, especially considering that large proportions of dieters are unsuccessful in achieving their weight- management goals, and that the participants were not obtained from intervention research. Indeed, participants in this study self-initiated their weight loss endeavors, and so the experiences discussed in this research represent those obtained outside of an artificial research framework. It is possible, therefore, because participants self-initiated their weight management, that these participants possessed sufficient self-efficacy to develop the behaviors necessary to experience positive weight changes. Within SCT behaviors are learnt through observational learning and modeling. Self-efficacy therefore can be enhanced by helping individuals learn and model new behaviors, or, by modifying unwanted behaviors by changing the reinforcements of that behavior. Strategies that enhance an individual's weight-loss self-efficacy, such as those highlighted above, might be an effective weight-loss treatment.[27]

iii) Behavior change Interventions

Though formal behavior change interventions and self guided efforts at individual behavior change are successful in inducing weight loss, however, few people manage to maintain these changes in weight over the long term.[28] Weight loss from behavioral interventions typically peaks at around six months into the weight loss attempt, followed by gradual regain of weight in most individuals. As maintenance of the weight loss is crucial to uphold health benefits, understanding how best to support people in sustaining weight loss is paramount to controlling the obesity epidemic and its consequences.

Compared with initiation of weight loss, the evidence base for maintenance of weight loss is in its infancy. A recent systematic review of 13 randomized controlled trials examining effects of "extended care" for weight loss maintenance reported an average 3.2 kg difference in weight regain between extended care and no or minimal additional contact.[28] Other reviews that have examined weight loss maintenance studies confirm the potential of successful maintenance treatment, although there is considerable heterogeneity between studies. Currently available reviews are limited by not using meta-analyses, no separation of studies focused on weight loss or maintenance, the use of restrictive inclusion

criteria focusing on specific subsets of non-surgical studies, inclusion of non-randomized trials, or a lack of systematic identification of studies.

Approach No. 6 – Tackling Environmental Stability

Environmental issues created problems for the group, and these ranged from work-related and lifestyle constraints to the exposure to appetite-promoting stimuli in the home. Environmental stability appears to be important for long-term weight management, and participants suggested that when stability became compromised, through issues such as erratic working hours, travel, poor food availability and scheduling problems, that consistency to weight-loss behaviors became challenging.[5] This reflects the theory of planned behavior (TPB), where life circumstances outside of an individual's perceived behavioral control might create difficulty achieving or maintaining a behavior (such as weight-loss dieting), despite the presence of the intention to engage with the behavior.[29] Stressful life events were revealed to be particularly problematic by participants in this research, and stress-related and emotional eating episodes manifested from difficult life circumstances. Research elsewhere highlights similar findings, and multiple sources of evidence indicate that successful dieters develop coping strategies that accommodate for difficult life circumstances.[30] The ability to cope and successfully navigate difficult life events might therefore be an important factor in successful weight loss, regardless of the research context underpinning its observation.

Approach No.7 – Strategically Improving Social Support

Eating out led to the perception that participants needed to make eating decisions that lead to the consumption of non-diet foods, or risk alienation from their social groups. This led to some participants' self-imposed social exclusion, which might be a common occurrence for some dieting individuals.[31]

Social eating and drinking also exposed participants to stigma, where participants felt judged while eating out, which then led to feelings of self-consciousness, exacerbating the (perceived) need for isolation further. Participants were vocal of the need to obtain social support to accommodate such issues and eliminate feelings of alienation, provide stability, and engender the perception of moral support. Social support was therefore sought from friends, family and spouses, and from work colleagues and slimming clubs, which reflects evidence elsewhere.[32]

The perception of being supported appeared to be more important than the mode of support experienced however, which is complicit with evidence elsewhere. However, spouses and family could also act as saboteurs to participants' efforts, tempting them with forbidden foods, or eating forbidden foods in their presence, with little consideration to the participants' challenges, emotions and motivations.[32]

Interestingly, these findings have also been reported elsewhere, and highlight that while significant others appear to play an important, facilitative role in dieting, they can be destructive also.[31] Further research might be needed to corroborate some of the findings of this study and further investigate social difficulties experienced while dieting, in particular the motives and mechanisms of conscious/unconscious spousal sabotage, which appeared to be particularly challenging for participants in this study, but might also be understated in the literature at this time.

Approach No.8 – Bariatric Surgeries

According to the 1991 National Institutes of Health (NIH) consensus conference bariatric surgery is an effective option for treating individuals categorized as having morbid obesity.[33] A randomized controlled trial comparing bariatric

surgery with nonsurgical treatment showed that the mean difference in weight loss at 24 months of follow-up greatly favored surgical therapy.[34] Surgery is currently the best-established and most successful method for sustained weight loss in the morbidly obese.[35] Several bariatric operations were introduced in the past 4 decades, encompassing a spectrum from primarily restrictive, to combined restrictive/malabsorptive, to purely malabsorptive operations. Roux-en-Y gastric bypass is currently the most commonly performed operation for treating morbid obesity, representing approximately 70% to 75% of all bariatric procedures.[36]

Because of efficacy, the number of bariatric surgery procedures is growing exponentially. It seems obvious that restriction of movement of food through the gastrointestinal tract might limit food intake and reduce fat storage, at least in the short term. However, the reduction in adiposity often exceeds that expected by the reduction in food intake per se. Mechanisms that result in impressive loss of stored fat due to surgery are far from totally understood. Therefore, we have chosen to bring together much of the evidence related to bariatric surgery and loss of adiposity.

a) Gastric Restrictive (Laparoscopic Adjustable Gastric Banding, Vertical Banded Gastroplasty, Sleeve Gastrectomy)

Laparoscopic adjustable gastric banding (LAGB) is the most commonly performed bariatric surgery procedure performed worldwide. Together with the second most common, laparoscopic Roux-en-Y gastric bypass (RYGB), they accounted for 82% of the bariatric surgeries performed worldwide in 2008. It is estimated that 112,200 adjustable gastric banding (AGB) surgeries were performed in 2008 in the United States and 168,597 worldwide.[37] Average weight loss post-LAGB, according to a meta-analysis, is 42.6% Estimated Weight Lost at 1 year, 50.3% at 2 years, and 55.2% at >3 years post surgery.[37] Another report indicates 59% EWL at 8 years post-LAGB.[38]

Vertical banded gastroplasty(VBG) was introduced in 1980 and, in its original form, had a relatively higher complication rate and lower success rates in weight loss than other procedures. MacLean's modification of the standard open Mason procedure resulted in a decrease in complication rate and a good weight loss, but the procedure is infrequently used.[39] In 2008, VBG accounted for 1.1% of total bariatric surgeries performed worldwide.[40]

Sleeve gastrectomy (SG) was initially introduced as the first step of the duodenal switch procedure but is now used as a standalone procedure, frequently in the laparoscopic approach. The greater curvature of the stomach is resected, producing a tubular stomach that resembles the size and shape of a banana.[41]

b) Gastric Bypass and Intestinal Transposition (Roux-En-Y-Gastric Bypass, Biliopancreatic Diversion, Jejuno Ileal Bypass)

In this group of procedures, stomach restriction is combined with rearrangement of various portions of the gastrointestinal tract such that nutrients are diverted toward the lower intestine while the upper intestine is bypassed. Most of the weight loss post-bariatric surgery occurs in the first 2 years after surgery, but there is some information regarding long-term weight loss. In a Dutch Bariatric Surgery Group study, maximum weight loss of 70% EWL was achieved on average by 17 months, but only 45% of EWL was maintained 8 years after GB.[42] After laparoscopic gastric banding, average EWL was reported to be 30% at 9 or more years.[43]

Clearly, bariatric surgery is a highly efficacious approach to causing weight loss. It is therefore of great interest to examine putative mechanisms that may synergize reduced flow of nutrients through the gastrointestinal tract to

understand why surgery is so effective.

Approach No.9 -Non-surgical Procedures

The Aspire Assist is a new, FDA-approved weight loss solution for people with obesity. Unlike many other weight loss procedures, it's non-surgical and reversible. In a U.S. Clinical Trial, patients lost 3 times as much weight on average with the Aspire Assist as those who received only diet and exercise counseling. Placing the device is an outpatient procedure. Patients can often return home within one to two hours and be back at work quickly.[44]

The quick 15 minute procedure is performed under "twilight anesthesia" – general anesthesia is usually not required. Although there are no specific foods that are off-limits with the Aspire Assist, subjects gradually learn healthier behaviors with the lifestyle counseling program, to help keep the weight off long-term. The Aspire Assist can be removed at any time through a 10-minute outpatient procedure. It is usually performed under twilight anesthesia. Because the procedure and device are relatively simple, the Aspire Assist may be affordable for patients who cannot afford bariatric surgery.

Approach No. 10 - Testosterone supplementation

The Institute of Medicine (IOM) has come out with a 478-page plan to completely change the way that Americans approach weight loss. IOM chairman Daniel R. Glickman want to change the way exercise and nutrition are approached by Americans. According to a recent BBC report, testosterone supplements could help hormone deficient men lose weight. When the effects of testosterone were as examined in a study conducted over 5 years it was found that an average of 16 kg was lost by the study participants when their hormone levels were restored to normal.[45]

Both waist circumference as well as blood pressure was controlled with the help of the supplements.[45] Though effective against weight gain, this may not be the best answer because of the risk of developing heart disease and prostate cancer, warn experts.. It is best to try and lose weight naturally, which causes a natural increase in testosterone levels.

Approach No. 11 – Following Latest fads "Egg breakfast for weight loss"

The effects of an egg breakfast were examined recently. It was found that eating egg for breakfast could keep a person fuller and going for longer.[46] It could also decrease the amount that the person ate at lunch. It is the protein content in the egg that improves satiety levels and keeps one from overeating.

CONCLUSION

According to our review, successful weight maintenance is associated with more initial weight loss, reaching a self-determined goal weight, having a physically active lifestyle, a regular meal rhythm including breakfast and healthier eating, control of over-eating and self-monitoring of behaviors.

Weight maintenance is further associated with an internal motivation to lose weight, social support, better coping strategies and ability to handle life stress, self-efficacy, autonomy, assuming responsibility in life, and overall more psychological strength and stability. Factors that may pose a risk for weight regain include a history of weight cycling, disinhibited eating, binge eating, more hunger, eating in response to negative emotions and stress, and more passive reactions to problems.

Yet the ultimate challenge is to maintain weight loss. Likewise, whether long-term adoption of either regimen is either tenable or even harmful to health remains to be seen. Exercise may also be beneficial in maintaining weight loss. Activity that expends about 2500 kcal/wk has shown benefit in helping patients maintain weight losses.

Some drugs that have been used to treat obesity but are not approved by the FDA for this purpose. Several drugs approved for purposes other than weight loss have been used for the treatment of obesity including metformin, fluoxetine, bupropion, topiramate, and zonisamide. Physicians who decide to try these agents are using them off-label and would be well advised to do so only with signed informed consent from the patient.

The results suggest that psychological factors may provide some explanation as to why many people with obesity regain weight following successful weight loss. The factors identified in this study need to be examined further using prospective designs. The difficulty in helping obese patients maintain a long-term weight loss has been challenged by recent studies showing that several individuals are able to maintain acceptable weight loss targets in the long term and by the promising results achieved by the new-generation lifestyle modification programs.

These promising results should stimulate the adoption of multidisciplinary approaches based on lifestyle modification for the management of obesity. Only comprehensive programs administered by no eclectic teams addressing any mediator of lifestyle modification, managing the several medical and psychological complications associated with obesity and, if indicated, coupling the lifestyle treatment with other interventions (eg, drugs, residential inpatient treatment, and bariatric surgery) might be successful. The effectiveness and the cost-efficacy of a stepped-care approach should be evaluated by future longitudinal observational studies.

REFERENCES

1. https://doi.org/10.1093/ajcn/82.1.222S
2. https://doi.org/10.1002/j.1550-8528.1999.tb00416.x
3. https://doi.org/10.1002%2F14651858.CD012651
4. http://dx.doi.org/10.2337/dc12-0733
5. https://doi.org/10.1007%2Fs13679-015-0161-z
6. *BMJ* 2014; 348: g2646 https://doi.org/10.1136/bmj.g2646
7. Greenway, F. Physiological adaptations to weight loss and factors favouring weight regain. *Int J Obes*, 2015; 39: 1188–1196. https://doi.org/10.1038/ijo.2015.59
8. Rogerson, D., Soltani, H. & Copeland, R. The weight-loss experience: a qualitative exploration. *BMC Public Health*, 2016; 16: 371. https://doi.org/10.1186/s12889-016-3045-6.
9. Elfhag K, Rössner S. Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. Obes Rev, 2013; 6: 67–85.
10. Hindle L, Carpenter C. An exploration of the experiences and perceptions of weight loss. J Hum Nutr Diet, 2011; 24: 342–50.
11. Chambers JA, Swanson V. Stories of weight management: factors associated with successful and unsuccessful weight maintenance. Br J Health Psychol, 2012; 17: 223–43.
12. https://doi.org/10.1016/j.amjmed.2004.05.024
13. Norris, S.L., Zhang, X., Avenell, A., Gregg, E., Bowman, B., Serdula, M., Brown, T.J., Schmid, C.H. and Lau, J., Long-term effectiveness of lifestyle and behavioral weight loss interventions in adults with type 2 diabetes: a meta-

analysis. *The American journal of medicine*, 2004; *117*(10): 762-774.

14. Kumanyika, S.K., Obarzanek, E., Stettler, N., Bell, R., Field, A.E., Fortmann, S.P., Franklin, B.A., Gillman, M.W., Lewis, C.E., Poston, W.C. and Stevens, J., Population-based prevention of obesity: the need for comprehensive promotion of healthful eating, physical activity, and energy balance: a scientific statement from American Heart Association Council on Epidemiology and Prevention, Interdisciplinary Committee for Prevention (formerly the expert panel on population and prevention science). *Circulation*, 2008; *118*(4): 428-464.
15. Bray, G.A., Lifestyle and pharmacological approaches to weight loss: efficacy and safety. *The Journal of Clinical Endocrinology & Metabolism*, 2008; *93*(11_supplement_1): s81-s88.
16. Earnest, C.P., Lavie, C.J., Blair, S.N. and Church, T.S., Heart rate variability characteristics in sedentary postmenopausal women following six months of exercise training: the DREW study. *PloS one*, 2008; *3*(6): e2288.
17. Shi X, Karmali S, Sharma AM, Birch DW. A review of laparoscopic sleeve gastrectomy for morbid obesity. Obes Surg, 2010; 20(8): 1171–1177. [PubMed]
18. Mason EE, Ito C. Gastric bypass in obesity. Surg Clin North Am., 1967; 47(6): 1345–1351. [PubMed]
19. Crookes PF. Surgical treatment of morbid obesity. Annu Rev Med., 2006; 57: 243–264. [PubMed]
20. Elder KA, Wolfe BM. Bariatric surgery: a review of procedures and outcomes. Gastroenterology, 2007; 132(6): 2253–2271. [PubMed]
21. Lindvall, K., Jenkins, P., Emmelin, M., Scribani, M., Norberg, M., Larsson, C. and Weinehall, L., Primary weight maintenance: an observational study exploring candidate variables for intervention. *Nutrition Journal*, 2013; 12: 1-10.
22. Thomas, J.G., Bond, D.S., Phelan, S., Hill, J.O. and Wing, R.R., Weight-loss maintenance for 10 years in the National Weight Control Registry. *American journal of preventive medicine*, 2014; *46*(1): 17- 23.
23. https://pubmed.ncbi.nlm.nih.gov/23855935/
24. https://www.sciencedaily.com/releases/2016/09/160927083310.htm
25. https://www.ncbi.nlm.nih.gov/pmc/articles/
26. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4855339/
27. https://www.ncbi.nlm.nih.gov/books/NBK221839/
28. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4020585/
29. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4855339/#CR19
30. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4855339/#CR1
31. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4855339/#CR31
32. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4855339/#CR7
33. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3569476/
34. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3806364/
35. https://my.clevelandclinic.org/health/treatments/bariatric-surgery
36. https://www.ncbi.nlm.nih.gov/books/NBK553157/
37. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3208891/
38. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3208891/#b18
39. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3208891/#b20
40. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3208891/#b16
41. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3208891/#b21

42. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3208891/#b28
43. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3208891/#b28
44. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5350543/
45. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3529980/
46. https://nutritionsource.hsph.harvard.edu/food-features/eggs/