



Strategies in the Prevention and Treatment of Obesity: Innovations, Challenges, and Availability

Estratégias na Prevenção e Tratamento da Obesidade: Inovações, Desafios e Disponibilidade

Estrategias en la Prevención y el Tratamiento de la Obesidad: Innovaciones, Desafíos y Disponibilidad

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ABSTRACT

Objective: This study aims to present the most recent advances and the challenges encountered in the provision of pharmacological, surgical, and multidisciplinary programs for the treatment of obesity.

Methods: This is a narrative literature review with a qualitative and exploratory approach, conducted in July 2025. The theoretical framework was based on studies published between 2020 and 2025, focusing on strategies for obesity prevention and treatment, particularly pharmacological therapies, bariatric surgery, and multidisciplinary programs at regional and national levels. The search was conducted in the PubMed, SciELO, and Google Scholar databases using the following keywords: “supply,” “pharmacological treatment of obesity,” “obesity prevention,” “sibutramine,” “orlistat,” “liraglutide,” “semaglutide,” “tirzepatide,” “bariatric surgery,” and “multidisciplinary program.”

Results: Pharmacological treatment demonstrated an average weight loss of 15–20% in controlled trials. Bariatric surgeries (sleeve gastrectomy and gastric bypass) led to remission of comorbidities in more than 50% of patients. Multidisciplinary programs improved treatment adherence and metabolic parameters.

Conclusion: The combination of pharmacotherapy, surgery, and multidisciplinary programs optimizes outcomes in obesity management. Public policies should be expanded to ensure equitable access and the implementation of integrated care teams.

Keywords: Obesity; Anti-obesity agents; Bariatric surgery; Obesity management.

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RESUMO

Objetivo: Este estudo tem como objetivo apresentar os avanços mais recentes e os desafios enfrentados na oferta de programas farmacológicos, cirúrgicos e multidisciplinares para o tratamento da obesidade. **Métodos:** Trata-se de uma revisão narrativa da literatura, com abordagem qualitativa e exploratória, realizada em julho de 2025. A fundamentação teórica baseou-se em estudos publicados entre 2020 e 2025, com foco em estratégias de prevenção e tratamento da obesidade, especialmente terapias farmacológicas, cirurgia bariátrica e programas multidisciplinares em níveis regional e nacional. A busca foi realizada nas bases PubMed, SciELO e Google Scholar, utilizando as palavras-chave: “oferta”, “tratamento farmacológico da obesidade”, “prevenção da obesidade”, “sibutramina”, “orlistate”, “liraglutida”, “semaglutida”, “tirzepatida”, “cirurgia bariátrica” e “programa multidisciplinar”. **Resultados:** O tratamento farmacológico apresentou perda média de peso de 15–20% em ensaios controlados. As cirurgias bariátricas (gastrectomia vertical e bypass gástrico) levaram à remissão de comorbidades em mais de 50% dos pacientes. Os programas multidisciplinares melhoraram a adesão ao tratamento e os parâmetros metabólicos. **Conclusão:** A combinação de farmacoterapia, cirurgia e programas multidisciplinares otimiza os resultados no manejo da obesidade. As políticas públicas devem ser ampliadas para garantir acesso equitativo e a implementação de equipes de cuidado integrado.

Palavras-chave: Chás, Hibiscus sabdariffa, Plantas medicinais, Fitoterapia, Terapias complementares.

RESUMEN

Objetivo: Este estudio tiene como objetivo presentar los avances más recientes y los desafíos enfrentados en la oferta de programas farmacológicos, quirúrgicos y multidisciplinarios para el tratamiento de la obesidad. **Métodos:** Se trata de una revisión narrativa de la literatura, con un enfoque cualitativo y exploratorio, realizada en julio de 2025. El marco teórico se basó en estudios publicados entre 2020 y 2025, centrados en estrategias de prevención y tratamiento de la obesidad, especialmente terapias farmacológicas, cirugía bariátrica y programas multidisciplinarios a nivel regional y nacional. La búsqueda se realizó en las bases de datos PubMed, SciELO y Google Scholar, utilizando las siguientes palabras clave: “oferta”, “tratamiento farmacológico de la obesidad”, “prevención de la obesidad”, “sibutramina”, “orlistat”, “liraglutida”, “semaglutida”, “tirzepatida”, “cirugía bariátrica” y “programa multidisciplinario”. **Resultados:** El tratamiento farmacológico mostró una pérdida media de peso del 15–20% en ensayos controlados. Las cirugías bariátricas (gastrectomía en manga y bypass gástrico) condujeron a la remisión de comorbilidades en más del 50% de los pacientes. Los programas multidisciplinarios mejoraron la adherencia al tratamiento y los parámetros metabólicos. **Conclusión:** La combinación de farmacoterapia, cirugía y programas multidisciplinarios optimiza los resultados en el manejo de la obesidad. Las políticas públicas deben ampliarse para garantizar un acceso equitativo y la implementación de equipos de atención integral.

Palabras clave: Tés, Hibiscus sabdariffa, Plantas medicinales, Fitoterapia, Terapias complementarias.

INTRODUCTION

According to the World Health Organization, obesity is a complex chronic disease characterized by excessive fat deposits that can harm health. Obesity can increase the risk of type 2 diabetes and heart disease, in addition to affecting bone health and reproduction, and increasing the risk of certain types of cancer. It also negatively impacts quality of life, sleep, and mobility (Who, 2021).

In 2024, the Risk Factor Collaboration (NCD-RisC) published results estimating that more than



one billion people worldwide live with obesity, including nearly 880 million adults and 159 million children and adolescents aged 5 to 19 years. An analysis of these data by the World Obesity Federation revealed that nearly 3 billion people live with overweight or obesity. These findings suggest that the majority of the global population now lives in countries where overweight and obesity pose a greater health risk than underweight (Wof, 2025). In Brazil, the prevalence of obesity increased by more than 60% between 2006 and 2018, rising from 11.8% to 19.8%. Beyond its health consequences, obesity also has a significant economic impact on individuals, families, countries, and healthcare systems (Lopes, 2021).

Because of its complex and multifactorial nature, obesity presents challenges in its management. Several countries around the world have issued high-level evidence-based recommendations regarding therapeutic care for individuals with overweight and obesity (Silva et al., 2021).

There are numerous methods for treating obesity. Lifestyle changes mainly focus on dietary re-education. However, caloric restriction yields the most significant results. In addition to dietary approaches, the practice of physical exercise, both aerobic and resistance training, is widely recommended (Lopes, 2021).

Pharmacological treatment of obesity is undergoing a transitional phase, although it remains highly stigmatized. Recently, it has been recommended that the term “anti-obesity medications” be used instead of “weight-loss drugs” (Moreira et al., 2024). Advances in the development of anti-obesity medications have been steady and positive, always based on scientific evidence and approved by major regulatory agencies that apply strict evaluation criteria to ensure the safety of patients undergoing treatment (Coutinho e Halpern, 2024).

In addition to safety, medications have improved in terms of efficacy, particularly regarding clinically relevant weight loss. Among them, tirzepatide stands out, with average weight loss reaching up to 20%, depending on the prescribed dose (Moreira et al., 2024).

Bariatric surgery is another widely sought and debated treatment option. It has shown significant results not only in weight loss but also in the remission of obesity-related diseases. However, its complications and eligibility criteria remain the subject of considerable debate. The demand for revisional bariatric surgery after vertical sleeve gastrectomy (VSG) has increased, yet the optimal procedure remains uncertain (Dantas et al., 2022).

Various approaches to treating obesity and Metabolic Syndrome (MS) have been investigated, including pharmacological interventions, behavioral therapies, medical devices, and bariatric surgery. In Brazil, over the past decade, the Ministry of Health has worked to address obesity by implementing policies to combat the condition and by developing guidelines for organizing obesity care through the creation of care pathways (Dos Reis, 2021). However, given the growing demand for obesity treatment, availability remains limited and poorly coordinated. Therefore, challenges and difficulties are evident in achieving effective obesity treatment (Ramos, 2025; Lopes, 2021; Dos Reis, 2021).

This study aims to present the latest developments and challenges in the provision of pharmacological, surgical, and multidisciplinary programs for obesity treatment.



METHOD

This study is a narrative literature review based on an exploratory qualitative research conducted between June and July 2025. The theoretical framework was grounded in updated articles and studies published in the last five years, focusing on the provision of strategies for the prevention and treatment of obesity, specifically pharmacological, surgical, and multidisciplinary programs at both regional and national levels.

The keywords used in the search were “Obesity,” “anti-obesity drugs,” “bariatric surgery,” and “obesity control,” applied in both Portuguese and English to ensure a broader scope of articles. The search was carried out using databases such as PubMed, SciELO, and Google Scholar.

RESULTS AND DISCUSSION

Due to the wide range of strategies for the prevention and treatment of obesity, the results were categorized according to the type of procedure/therapeutic approach, classified as pharmacological, surgical, and multidisciplinary treatment programs. In accordance with the order recommended in clinical guidelines, it is more consistent to present multidisciplinary treatment first, followed by pharmacological and surgical interventions.

Multidisciplinary Programs:

Among the approaches to obesity prevention and management are Multidisciplinary Obesity Treatment Programs (MOTP), which typically include physicians, nurses, nutritionists, psychologists, physical education professionals, and other health specialists as needed.

Multidisciplinary care is defined as a work methodology involving health professionals “with complementary expertise and skills, who share common health goals and perform combined physical and mental actions in patient assessment, planning, and care. This process is generally carried out through interdependent collaboration, open communication, and shared decision-making, thereby generating added value for the patient, the institution, and the team.” At the national level, this care model is relatively recent, emerging from reforms in public health policies and the establishment of the Unified Health System (SUS). SUS embraced the challenge of replacing the prevailing care model—focused primarily on disease treatment—by incorporating plans and strategies guided by the principles of universality, equity, and comprehensiveness of care. In 1994, the Family Health Program (FHP) was created to strengthen primary health care, with population care strategies structured around multidisciplinary teamwork aimed at developing educational activities focused on problem-solving and reality transformation (Ferraesi e Farias, 2023).

From the perspective of lifestyle medicine, health is closely linked to daily habits. In this regard, the transition from harmful to healthy behaviors requires not only counseling but also the application of behavioral science principles, ensuring long-term and sustainable changes (Brasileiro, 2025).

Within this framework, multidisciplinary care has the potential to provide effective treatment by



promoting meaningful transformations, greater patient autonomy, and sustainable lifestyle modifications. This model involves shared decision-making among professionals from different fields, such as physicians, nutritionists, physiotherapists, and psychologists. Consequently, treatment extends beyond weight loss, encompassing broader and more holistic interventions that address aspects not typically considered in single-professional approaches (Alvarenga et al., 2019).

The relevance of this approach lies in the fact that behavioral change is voluntary and predominantly self-directed, which can foster long-term transformation, enabling individuals to adopt healthier habits or eliminate harmful ones (Brasileiro, 2025).

A study conducted by Westphal-Nardo (2025), evaluated the effect of an intensive hybrid lifestyle intervention program on obesity treatment and concluded that, in adults with obesity undergoing usual medical care, the addition of an intensive hybrid lifestyle intervention program (involving both in-person and remote interventions) significantly improved weight loss. The study included adults with obesity receiving standard medical treatment, who were randomly assigned to either the intervention or control group, with a 20-week follow-up period. In the intervention group, participants followed a structured program with weekly activities, which included six group sessions lasting 30 to 60 minutes (two in person and four remote). In addition, participants received a total of five educational videos and ten text message-based lifestyle counseling interventions addressing diet, physical activity, and behavioral change. Usual medical care was maintained throughout the study.

All participants underwent evaluations of anthropometry, body composition, metabolic parameters, dietary intake, binge eating, and mental health. Results showed that, among the 200 patients included in the study, mean weight loss was significantly greater in the intervention group compared with the control group, -2.1 kg (-4.5 – 0.6 kg) versus -0.7 kg (-2.7 – 1.1 kg), respectively ($p=0.035$). These findings highlight the multiple benefits of multidisciplinary obesity treatment programs (MOTP), particularly in improving body composition, biochemical parameters, mental health, and behavioral outcomes.

A pragmatic clinical trial conducted in a municipality in southern Brazil assessed the effectiveness of remote nursing monitoring combined with a multidisciplinary obesity treatment program on cardiometabolic biomarkers and health-related physical fitness indicators in adults with obesity during the COVID-19 pandemic over a 16-week period. The results demonstrated significant improvements in glycemia, insulin, HOMA-IR, and HDL cholesterol, as well as in cardiorespiratory fitness and muscle strength, concluding that remote nursing monitoring combined with a multidisciplinary obesity treatment program is an effective intervention for improving cardiometabolic biomarkers and health-related physical fitness indicators (Utrila, 2023).

Another program, conducted with patients with morbid obesity who were candidates for bariatric surgery and without comorbidities, evaluated the effectiveness of a group cognitive-behavioral intervention on preoperative weight loss and quality of life. The average weight loss was 5.7 kg during the five-week intervention, with statistical significance ($p<0.001$). Simultaneously, BMI decreased

significantly. Regarding quality of life, significant improvements were observed in body image perception and in patients' attitudes toward treatment (Sierra-Murguía, 2014).

A study carried out in Spain with children aged 5 to 14 years aimed to identify different dietary and physical activity (PA) patterns in children and adolescents with high prevalence of overweight and obesity. Using cluster analysis based on adherence to the dietary guidelines of the Spanish Society of Community Nutrition and PA levels, the study further examined associations with age, sex, body composition, and cardiometabolic risk markers. Among 549 children, hierarchical cluster analysis identified subgroups with similar adherence. Cluster 3 presented a lower percentage of total body fat and higher lean body mass compared with Cluster 2, suggesting that adherence to PA recommendations alongside dietary guidelines was associated with more favorable body composition outcomes (Gil-Campos, 2021).

In several regions, the effectiveness of multidisciplinary programs has been evaluated. In the Federal District of Brazil, for instance, one study examined the effects of a multidisciplinary program in secondary health care on quality of life, body composition, and eating behavior. The findings indicated positive effects on body composition, quality of life, and eating behavior. However, maintaining healthy habits and sustaining a positive perception of quality of life in the long term remain a challenge. These results reinforce the need for individualized strategies and continuous support to ensure adherence and therapeutic success in obesity management (Brasileiro et al., 2025).

In southern Brazil, a study aimed to evaluate the effectiveness of a Multidisciplinary Obesity Treatment Program (MOTP) offered to adults (18–50 years) with a BMI above 30 kg/m². The program consisted of 48 exercise sessions combined with professional counseling on healthy lifestyle practices. For the analysis, participants were grouped according to tertiles of weight loss. The first tertile showed an average weight reduction of 7.6%, which is considered clinically significant. Likewise, this group also demonstrated greater mean percentage changes in body fat (–12.7%) and in the lean mass-to-fat mass ratio (LM/FM), which increased by 14.3%. Changes in insulin, HOMA-IR, and HOMA-B were approximately three times greater than variations in body weight, while TG and HbA1c changes were nearly twice as high. These results clearly demonstrated the effectiveness of the MOTP, which still requires testing in public health services. The authors further emphasized that adults with obesity, particularly severe obesity, must have access to treatment programs, which remain unavailable to the majority of the population (Westphal-Nardo et al., 2025).

In March 2013, the Brazilian Ministry of Health, through Ordinance No. 424, redefined the guidelines for organizing overweight and obesity prevention and treatment as a priority line of care within the Chronic Disease Care Network. The ordinance established the guarantee of adequate diagnostic and therapeutic support for the treatment of overweight and obesity, implementing a user-centered model of care based on individual health needs and respecting ethnic-racial, cultural, social, and religious diversity (Brasil, 2013).

Aligned with these guidelines, the need arose for a health care model that integrated obesity

promotion, prevention, and control measures, aiming to meet the targets of the action plan for tackling noncommunicable diseases (NCDs) and to achieve global goals by 2025. However, significant challenges and barriers remain regarding the implementation and execution of the strategies proposed in Ordinance 424/2013-MS (Ramos, 2025; Lopes, 2021).

Despite the efforts to address obesity in Brazil, program availability remains limited at both national and regional levels, being implemented primarily within Primary Health Care (PHC) through Basic Health Units (UBS). Obesity management in UBS is particularly challenging and requires intersectoral actions to be continuously carried out by multidisciplinary teams (De Luca et al., 2025).

A study by Lopes (2021), aimed to describe the adequacy of UBS facilities and work processes related to obesity management and to assess user satisfaction with health services. This cross-sectional study used data from the National Program for Access and Quality Improvement (PMAQ) 2013–2014, a nationwide initiative to evaluate health team performance. Data collection took place between 2013 and 2014 through interviews with health teams and service users. All adequacy indicators for obesity care were developed within the study, based on PMAQ data. A total of 24,055 UBS in 4,845 municipalities were evaluated, along with data from 114,615 users. Only 7.6% of UBS had adequate infrastructure for obesity treatment. Adequate access was reported in 26.6%, and adequate organization of services was found in 27.8% of units. Health care was rated as “good” or “very good” by 82.4% of users. These indicators varied across regions, with better results observed in the South and Southeast. The findings suggest that the country is still in the early stages of systematizing obesity care, with significant regional disparities.

Another study evaluated the organizational arrangements for obesity care in Brazilian municipalities. It identified weaknesses in the organization of the Overweight and Obesity Care Line, which requires strengthening in systematization, service provision, and inter-municipal coordination to overcome challenges in implementing an effective care line that meets the needs of individuals with overweight and obesity (Leite, 2024).

A study conducted in 92 municipalities in the state of Rio de Janeiro analyzed obesity prevention and control initiatives developed according to the principles underpinning Lowi’s classical typology of public policies and the Overweight and Obesity Care Line. The research, conducted between 2014 and 2018, aimed to identify the strategies adopted and the challenges faced in consolidating the actions established in the Care Line. Methods included secondary data analysis and review of governmental documents. The documents outlined a variety of actions—such as individual consultations, support groups, the Health Academy Program, and the School Health Program—which were reinforced by interviewees’ narratives. Despite these initiatives, municipalities in Rio de Janeiro faced persistent challenges, including limited human resources and inadequate health unit infrastructure and equipment. To increase mobilization against obesity, the issue must be explicitly prioritized in state and municipal agendas, rather than diluted within broader programs (Ramos et al., 2025).

Multidisciplinary care is a relatively recent approach that has been increasingly adopted by health



teams to counteract the growing specialization and fragmentation of care. Teams focusing on addressing comprehensive health needs and seeking complementary and effective solutions represent a strategy that enhances the quality and safety of care delivery, leading to better patient outcomes (Ferraesi e Farias, 2021).

One of the main challenges in obesity treatment is the widespread lack of understanding regarding its multifactorial causes. Obesity is often mistakenly attributed to lack of willpower or poor dietary habits, overlooking the physiological, genetic, metabolic, and environmental factors that play a significant role in its development (Padwal et al., 2004).

Pharmacological Treatment:

According to the Brazilian Obesity Guidelines (2016), pharmacological treatment acts as a secondary prevention strategy to prevent disease progression and complications, and must be combined with lifestyle changes, including physical activity, a calorie-restricted diet, and behavioral modification (Moreira et al., 2024).

The medications approved for the treatment of obesity in Brazil are: sibutramine, orlistat, naltrexone, bupropion, liraglutide, semaglutide, and, more recently, tirzepatide. Sibutramine is a medication used for the treatment of obesity, classified as a satiety-inducing agent, as it acts as a reuptake inhibitor of neurotransmitters such as serotonin, norepinephrine, and dopamine. Its effect occurs mainly through the regulation of food intake, leading more to prolonged satiety than to a direct reduction in hunger (Moreira et al., 2024).

The effects of sibutramine in obesity treatment can be observed both in weight loss (4 to 5 kg) and in weight maintenance, with about 10% to 30% of patients treated with sibutramine successfully maintaining their initial weight loss (Rucker et al., 2007). Positive effects have also been reported in the treatment of obesity in patients with Polycystic Ovary Syndrome, reducing key pathophysiological factors of the syndrome (Sabuncu et al., 2003). Regarding body composition, studies have not demonstrated significant changes (Moreira et al., 2024).

In Brazil, sibutramine was approved in 1998, making it the oldest weight-loss medication registered in the country. However, some countries such as the United States, Canada, and Australia have withdrawn it from the market, as studies conducted on individuals with pre-existing cardiovascular diseases and prolonged use of sibutramine showed an increased risk of non-fatal myocardial infarction and non-fatal stroke (Anvisa, 2018). Despite some studies associating sibutramine with negative effects, it is still used in Brazil for the treatment of obesity (Moreira et al., 2024).

Like other drugs approved by the Brazilian Health Regulatory Agency (ANVISA), sibutramine is not available in the Brazilian Unified Health System (SUS). In 2019, the Department of Science, Technology, Innovation, and Strategic Health Inputs (SCTIE/MS) and the Brazilian Association for the Study of Obesity and Metabolic Syndrome (Abeso) requested its incorporation into SUS for obesity treatment. However, the National Commission for the Incorporation of Technologies in SUS (CONITEC) recommended against its inclusion due to low safety and the potential for high financial impact on the



system (Anvisa, 2022).

Orlistat is a medication that acts in the gastrointestinal tract by reducing the absorption of dietary fat. Its mechanism of action is the irreversible inhibition of gastric and pancreatic lipases, leading to a reduction in the hydrolysis of triglycerides into fatty acids and monoglycerides and decreasing fat absorption by about 30% (Moreira et al., 2024).

At therapeutic doses (120 mg three times daily with main meals) administered along with a balanced, mildly hypocaloric diet, the inhibition of fat absorption (approximately 30% of ingested fat) contributes to an additional caloric deficit of about 200 calories (Guercioli, 1997).

When combined with a mildly hypocaloric diet, orlistat contributes to weight loss through this additional caloric deficit and promotes greater adherence of obese patients to dietary recommendations. Several double-blind, placebo-controlled studies have demonstrated a statistically significant weight loss of about 10% when orlistat was prescribed with a balanced, mildly hypocaloric diet to obese patients for one year. In addition, small but significant improvements in serum lipid levels were observed in these patients (Patel et al., 2025).

Studies have shown that orlistat provides beneficial effects not only in weight loss but also in weight maintenance and especially in reducing total cholesterol and LDL cholesterol in obese patients with dyslipidemia. In patients with type 2 diabetes, additional health benefits were observed when orlistat was used as adjuvant therapy (Ghosal et al., 2025). However, there is no evidence that orlistat improves hepatic fat content, nor does it significantly reduce triglyceride levels (Pan, 2020).

The main side effects of orlistat are gastrointestinal events such as steatorrhea, fecal urgency, flatulence with oily discharge, and abdominal pain, especially in individuals with poor dietary adherence (Rucker, 2007).

Like other obesity drugs, orlistat is not available in SUS. In 2020, CONITEC evaluated its potential incorporation but concluded against its inclusion for weight reduction in overweight or obese individuals within the Unified Health System (BRASIL M.S., 2020).

Another drug worth mentioning is naltrexone, which acts as a pure antagonist of the μ , κ , and δ opioid receptors, blocking the effects of endogenous endorphins. When used alone, it has shown the ability to modulate the brain reward system, directly affecting eating behavior and reducing compulsive intake of highly palatable foods (Chierici et al., 2022).

Another effect of this medication is the reduction of pleasure associated with excessive food intake, leading to greater adherence to dietary plans and consequently contributing to sustained weight loss (Leite et al., 2024).

More recent studies reinforce the therapeutic potential of naltrexone in reducing body weight and improving appetite control. Researchers conducted a systematic review and meta-analysis showing that the combination of naltrexone and bupropion promoted an average weight loss of $\geq 5\%$ compared to placebo (Moreira et al., 2024).

In addition, a positive impact was observed on metabolic markers such as fasting glucose, lipid



profile, and systolic blood pressure. These effects appear to be directly linked to naltrexone's action on cortico-striatal circuits associated with compulsive eating (Onakpoya et al., 2020).

The clinical benefits of naltrexone in weight management are not limited to weight loss. Many patients report improved relationship with food, reduced night-time binge eating, and better control over emotional triggers that previously led to dysregulated food intake (Ogura et al., 2024).

Despite advances, a sensitive issue related to prolonged naltrexone use is the possibility of weight regain after discontinuation. Studies show that patients may regain part of the weight lost within a year after stopping treatment, especially when sustained lifestyle changes are not maintained. This reinforces the need to understand naltrexone as an adjunct therapy, not a definitive solution, making its association with nutritional counseling, psychological support, and regular physical activity essential (Fonseca et al., 2024).

In summary, naltrexone represents a promising tool in the therapeutic arsenal against obesity, with positive effects supported by recent scientific evidence. However, its use must be carefully individualized, taking into account not only the patient's clinical profile but also behavioral and emotional aspects related to eating. Long-term success depends on the combination of pharmacotherapy and habit re-education, under continuous multidisciplinary supervision (Leite et al., 2024).

Bupropion (BUP) is a drug used in the treatment of depression and as an aid in smoking cessation. It has shown anorexigenic effects that may help with weight loss (Fava et al., 2019). In the therapeutic context, BUP, an atypical antidepressant that works as a dopamine and norepinephrine reuptake inhibitor, has emerged as a promising alternative for the treatment of overweight and obesity (Sharma e Salas, 2018).

According to studies by Grilo et al. (2022), the combination of bupropion and naltrexone (NAL) aims to potentiate its anorexigenic effect and may affect appetite and weight regulation through mechanisms of leptin action. Leptin's appetite-reducing effects are due to its stimulating action on pro-opiomelanocortin (POMC) neurons, a neuropeptide capable of decreasing appetite by acting on hypothalamic functions.

The activation of these neurons leads to the production of β -endorphin and alpha-melanocyte-stimulating hormone (α -MSH) (BILLES et al., 2024). The latter results in activation of the MC4R gene and secondary signaling pathways. This combined activation reduces appetite and increases energy expenditure (Sherman et al., 2016).

Naltrexone (NAL) is an opioid receptor antagonist that was initially approved for the treatment of opioid dependence and later alcohol dependence. In silva line with the role of opioids in the rewarding aspects of eating, NAL decreases subjective palatability, that is, the perceived taste of certain foods (particularly highly palatable foods). This effect occurs independently of nausea, a frequent side effect. Studies using NAL as anti-obesity monotherapy have shown unsatisfactory results. However, the combination of NAL with BUP has been approved by the FDA (Food and Drug Administration) and EMA (European Medicines Agency) for the treatment of obesity (Santos et al., 2014).



The BUP–NAL combination is a therapeutic option, though not the first choice for weight control. The reason for this approach lies in uncertainty surrounding cardiovascular safety (Niessen et al., 2016).

Studies conducted by Santos et al. (2019) and Lobo et al. (2021) examined the risks related to the use of these drugs, including BUP. The research highlighted potential health risks, particularly increased blood pressure, which may elevate the risk of cardiovascular problems. This represents a significant health threat for individuals seeking these drugs as a quick weight-loss solution. Both authors also reported cardiac arrhythmias—abnormal heart rhythms that can range from mild to severe—as a possible side effect of these drugs.

Liraglutide is an injectable medication belonging to the class of GLP-1 (glucagon-like peptide-1) analogs, an intestinal hormone that regulates appetite and glycemic control. Initially developed for type 2 diabetes treatment, liraglutide also demonstrated significant effects on body weight reduction and was later approved for the treatment of obesity and overweight with comorbidities (Andrade et al., 2021).

The SCALE study followed 3,600 participants biweekly for 56 weeks, with 2,400 treated with liraglutide and 1,200 in the placebo group, both associated with lifestyle counseling. Results indicated that liraglutide promoted significantly greater weight loss in overweight or obese adults without diabetes, including individuals with prediabetes or borderline BMI. In addition to greater efficacy compared to placebo (average –8.0% body weight), improvements in cardiovascular risk factors were observed, although changes in lipid profile had uncertain clinical relevance (Pi-Sunyer et al., 2015).

Research on liraglutide in patients with type 2 diabetes and obesity highlighted its role in promoting satiety, delaying gastric emptying, and reducing appetite, supporting weight loss in obese individuals. It also acts on the hypothalamus to regulate food intake. In patients with type 2 diabetes, liraglutide improves glycemic control by stimulating insulin, inhibiting glucagon, and reducing hepatic glucose production. It also contributes to insulin sensitivity and reduction of cardiovascular risk factors such as blood pressure (De Fraga e Deuner, 2024).

Liraglutide is generally well tolerated, with the most common side effects being nausea, diarrhea, and vomiting, which tend to be mild and transient. In rare cases, acute pancreatitis or thyroid neoplasms may occur (Ribeiro, 2023).

The efficacy of liraglutide in weight and comorbidity control is enhanced when combined with non-pharmacological interventions such as diet and physical activity under professional guidance (Mirabelli et al., 2020). However, weight maintenance depends on continuous treatment and behavioral interventions. Discontinuation of liraglutide may lead to progressive weight regain, especially without nutritional, psychological, and physical activity support. An extension of the SCALE trial by Zhaohu et al. (2022) demonstrated that patients who discontinued liraglutide after 56 weeks partially regained lost weight in subsequent months, due to the loss of its pharmacological effects on satiety, gastric emptying, and appetite regulation, as well as compensatory metabolic adjustments.

These findings reinforce the need for continuous multidisciplinary management and, in some cases, prolonged pharmacological treatment with individualized monitoring. Semaglutide is a drug used

for weight control and diabetes treatment, classified as a GLP-1 receptor agonist. This intestinal hormone, secreted after meals, mimics endogenous GLP-1 functions, reversing hyperglycemia and inducing weight reduction.

Ozempic, whose active ingredient is semaglutide, is a hypoglycemic drug approved for type 2 diabetes (T2DM), characterized by insulin resistance. Although effective for weight and glycemic control, lifestyle changes such as healthy eating and exercise remain the main strategies for fat reduction and prevention of comorbidities (Weber et al., 2023).

According to Fornes et al. (2022), semaglutide 2.4 mg is a highly effective weight-control agent with a safety profile similar to other GLP-1 receptor agonists. It is a viable option for chronic weight management, with data up to 2 years. The most frequent side effects were gastrointestinal, including nausea, vomiting, constipation, and diarrhea, consistent with those reported for the GLP-1 class. Currently, it is the only once-weekly weight-loss medication, though its cost limits accessibility.

A randomized, double-blind, placebo-controlled, two-period crossover trial by Hjerpsted et al. (2017), reported that semaglutide reduced fasting glucose and glucagon, increased insulin, and improved postprandial glucose and lipid metabolism compared to placebo. Semaglutide also delayed gastric emptying during the first hour after a meal. In a clinical trial by Marso et al. (2016), the rate of cardiovascular death, nonfatal myocardial infarction, or nonfatal stroke was lower among patients treated with semaglutide compared to placebo.

Thus, while Hjerpsted et al. (2017) elucidated semaglutide's metabolic mechanisms, Marso et al. (2016), demonstrated its efficacy in reducing cardiovascular events, consolidating its role in managing T2DM patients at high cardiovascular risk.

Overall, semaglutide has proven effective for obesity treatment, promoting significant weight loss and reducing risks of obesity-related complications such as cardiovascular disease and diabetes (Moreira et al., 2024; Andrade, 2021). Clinical evidence indicates early efficacy, with weight reduction within the first two weeks of treatment, although gastrointestinal side effects are common.

Tirzepatide is the first incretin-based drug with a dual mechanism of action, being a synthetic peptide acting as a dual GLP-1 and GIP receptor agonist. Its therapeutic effects on glycemic control and body weight are not yet fully understood (Moreira et al., 2024). In Brazil, ANVISA approved tirzepatide for weight-loss treatment in June 2025, although it had already been approved for type 2 diabetes since 2023 (Anvisa, 2025).

In clinical trials, the main adverse effects of tirzepatide were gastrointestinal, including nausea, vomiting, and diarrhea, consistent with other drugs used in type 2 diabetes (T2DM) management. Hypoglycemia episodes were reported, although infrequent, especially in monotherapy or controlled use (Fontes e Souza, 2023).

Additionally, subcutaneous injection site reactions such as pain, redness, or induration have been reported. The risk of hypoglycemia is higher when combined with sulfonylureas or insulin, reinforcing the need for individualized treatment and close monitoring in combined therapies (Siebra et



al., 2024).

Figure 1: Gastrointestinal side effects described in the literature from the use of Tirzepatide and their frequency of occurrence.

Gastrointestinal side effect	Frequency of occurrence
Nausea 15–30%	Nausea 15–30%
Vomiting 10–25%	Vomiting 10–25%
Diarrhea 20–35%	Diarrhea 20–35%
Abdominal discomfort 15–30%	Abdominal discomfort 15–30%
Constipation 5–15%	Constipation 5–15%
Abdominal distension 10–20%	Abdominal distension 10–20%

Source: (Fernandez et al., 2023).

Robust clinical studies, such as SURMOUNT-4, investigated the effects of discontinuing Tirzepatide. In this study, participants who, after 36 weeks of treatment and an average weight loss of 20.9%, were switched to a placebo, experienced a weight regain of about 14% over the following year. In contrast, the group that continued with the medication lost an additional 5.5% of their body weight.

The discontinuation of Tirzepatide treatment leads to weight regain because the physiological mechanisms of appetite and metabolism control, which were being modulated by the drug, return to their previous state. Most patients who stop using the medication regain a significant portion of the weight lost, as hunger increases and metabolism may slow down. Only a small percentage of individuals (about 16.6% in the SURMOUNT-4 study) manage to maintain most of the weight lost one year after discontinuing the drug. This reinforces the view that obesity is a chronic disease that may require long-term treatment to maintain results (Moreira et al., 2024).

A systematic review on the pharmacological treatment of obesity showed that this therapy has advanced significantly, with the introduction of innovative drugs such as GLP-1 agonists, which have demonstrated efficacy in weight reduction and improvement of metabolic parameters. However, these advances still face barriers, such as the high cost of medications and treatment adherence, especially in vulnerable populations. The implementation of personalized strategies that consider the genetic and behavioral characteristics of patients is essential to optimize outcomes and ensure that treatment is effective in the long term (Alexandre, 2025).

Pharmacological treatment can and, in some cases, should be part of a combined therapy for people with obesity, also associated with other changes such as dietary modifications, physical activity, and psychological and emotional support. The overall treatment of obesity should be supported by different approaches and should never be focused solely on one method, such as only using medications or only implementing diets. Since it is a multifactorial disease, it requires multiple approaches to help in its control and treatment (Padwal et al., 2011).



Bariatric and Metabolic Surgery:

Obesity, globally recognized as an epidemic, has become one of the greatest threats to public health in recent decades (World Health Organization, 2021).

Its repercussions go beyond weight gain, negatively affecting life expectancy and quality of life, while promoting comorbidities such as type 2 diabetes, hypertension, heart disease, and certain types of cancer. In this scenario, bariatric surgery has emerged as a promising treatment, not only providing significant weight loss but also producing remarkable improvements in associated comorbidities (Andrade et al., 2021).

Bariatric surgery is indicated for individuals with obesity who have not responded positively to conventional treatments (Andrade, Cesse e Figueiró, 2023). The management and treatment of patients with grade III obesity is long and complex, which is why surgical treatment is often chosen. Due to the complexity of severe obesity, multidisciplinary work is essential for assessment and treatment, involving bariatric surgeons, endocrinologists, nutritionists, dietitians, psychologists, psychiatrists, and nurses (Andrade et al., 2021).

Bariatric surgery has shown continuous improvement and increased safety over the years, being considered an effective and safe procedure for patients, with a low mortality rate (Fagundes et al., 2022).

Currently, the most frequently performed bariatric surgery techniques are: Roux-en-Y gastric bypass (RYGB), sleeve gastrectomy, adjustable gastric banding, and biliopancreatic diversion with duodenal switch (BPD/DS). Each technique has its indications according to the profile and needs of individuals with obesity. Although effective, each presents benefits and drawbacks that must be considered in obesity treatment (Han et al., 2024).

Sleeve gastrectomy (SG) promotes weight loss, type 2 diabetes remission, nonalcoholic fatty liver disease improvement, and other comorbidities through several mechanisms. Other restrictive procedures, such as laparoscopic adjustable gastric banding (LAGB) and vertical banded gastroplasty (VBG), were widely adopted in the 1980s and 1990s but were progressively abandoned after the introduction of SG (De Luca et al., 2025).

However, many patients who experience failure with these procedures, including long-term complications and/or weight regain, are commonly referred to bariatric centers. In fact, a series of medium- and long-term follow-ups of patients who underwent restrictive bariatric surgery demonstrated a considerable failure rate, and revisional bariatric surgery is often indicated to achieve adequate weight loss and/or treat postoperative complications resistant to medication, such as gastroesophageal reflux disease (GERD) (Chierici et al., 2022).

Roux-en-Y gastric bypass (RYGB): also known as gastric bypass, accounts for up to 90% of surgical procedures and is considered the gold standard method. This technique reduces the stomach's capacity to 10%, restricting the amount of food ingested and rerouting it from the duodenum to the jejunum. This reduces ghrelin (the hunger hormone) and increases the release of gut hormones that



promote satiety. Consequently, patients experience appetite reduction, usually without diarrhea or malnutrition, and comorbidities associated with obesity improve rapidly. Risks include fistulas, pulmonary embolism, and infections (Sanches, 2021).

The advent of robotic surgery has brought a new perspective on obesity treatment. Its greater precision, flexibility, and higher-resolution imaging compared with laparoscopy have made robotic surgery more attractive for both surgeons and patients. Despite these advances, there are disadvantages: as a recent method, costs remain high, and surgical time is considerably longer due to limited experience and the steep learning curve. This increases risks such as infections, postoperative ventilatory disorders, thromboembolic events, and prolonged anesthetic recovery (Milagres et al., 2023).

Bariatric surgery is available within Brazil's Unified Health System (SUS) and, since 2013, through Ordinances No. 424 and 425/2013, as a form of treatment for obesity and associated diseases. According to Ordinance 424, patients who meet the following requirements are eligible for the procedure:

- 1- Individuals with BMI ≥ 50 kg/m²;
- 2- Individuals with BMI ≥ 40 kg/m², with or without comorbidities, who have not succeeded with longitudinal clinical treatment in Primary Care and/or Specialized Outpatient Care for at least two years and have followed clinical protocols;
- 3- Individuals with BMI > 35 kg/m² and comorbidities, such as high cardiovascular risk, type 2 diabetes and/or uncontrolled hypertension, sleep apnea, or degenerative joint diseases, who have not succeeded with longitudinal clinical treatment for at least two years and have followed clinical protocols.

Currently, the minimum age for bariatric and metabolic surgery is 16 years. In May 2025, the Federal Council of Medicine (CFM), through Resolution CFM No. 2,429/2025, updated the rules for bariatric and metabolic surgery, making patients with BMI between 30 and 35 eligible if they have type 2 diabetes, severe cardiovascular disease with target organ damage, early chronic kidney disease due to type 2 diabetes, severe sleep apnea, nonalcoholic fatty liver disease with fibrosis, conditions requiring transplantation, surgically indicated GERD, or severe osteoarthritis.

Resolution CFM No. 2,429/2025 does not restrict age or define minimum/maximum disease duration. Under the previous rules, surgery was limited to patients with more than 10 years of diabetes, between 30 and 70 years of age, and with at least two years of endocrinology follow-up showing refractoriness to treatment.

Regarding adolescents, the CFM now recognizes surgery for patients from 14 years of age in cases of severe obesity (BMI > 40 kg/m²) associated with clinical complications, provided there is multidisciplinary evaluation and consent from guardians. The resolution also requires that surgeries be performed in large hospitals with high-complexity surgical capacity, intensive care units, 24-hour medical staff, and compliance with criteria established by the Ministry of Health (Ordinances 424/2013 and 425/2013).

ANVISA, currently the regulatory agency responsible for criteria regarding bariatric and

metabolic surgery within SUS, has not yet taken a position on the CFM Resolution. It is important to note that ANVISA oversees laws, resolutions, and ordinances within public institutions, while resolutions are legal norms designed to regulate internal matters.

A study investigated access to nine bariatric surgery services that performed 50 or more procedures through SUS in the state of São Paulo in 2013. Although SUS guidelines state that Primary Health Care should be the main entry point into the system, this was observed in only one of the services (Lopes et al., 2025).

There is a clear need to standardize the organizational model of access to surgical treatment services for individuals with obesity within SUS.

CONCLUSIONS

The treatment of obesity is inherently complex and encompasses multiple strategies aimed at weight reduction and the improvement of overall health in affected individuals. Among these strategies are pharmacological interventions and bariatric surgery; however, effective management extends far beyond these measures. Lifestyle modification remains the most crucial and fundamental component for ensuring long-term success in treatment and represents the cornerstone of preventive strategies against this challenging condition.

It is important to emphasize that pharmacological treatments for obesity are largely inaccessible to the populations that most require them. In addition to their high cost, such medications are not incorporated into public health systems. In Brazil, for instance, none of these drugs are available through the Unified Health System (SUS). Bariatric surgery, conversely, is provided by SUS, and individuals receiving primary health care who present a Body Mass Index (BMI) above 35 kg/m²—with or without comorbidities—and who have not achieved adequate progress through multidisciplinary treatment over a two-year period, are eligible for the procedure. Nevertheless, surgery is not considered the primary therapeutic approach to obesity, and it remains a bureaucratic process associated with long-term costs for the public health system.

The promotion of healthier dietary habits and regular physical activity constitutes an accessible and easily implemented approach for the population, demonstrating long-term effectiveness and the potential for integration into governmental health programs.

Therefore, obesity treatment must adopt a comprehensive perspective, addressing its multifactorial origins and focusing primarily on the individual's overall health rather than exclusively on weight reduction. This process necessarily involves the collaboration of a multidisciplinary team with expertise in the field.

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