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## Obesity in Adults: Causes, Health Consequences, and Treatment Methods

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## **Abstract**

### **Introduction**

Obesity is defined as an excessive accumulation of body fat that can negatively affect a person's physical as well as mental health. It results not only from excessive caloric intake relative to energy expenditure, but also from a myriad of genetic, metabolic, environmental and behavioral factors. Obesity poses the risk of a number of chronic diseases that impair quality of life and increase the risk of death. Understanding the causes of obesity, the consequences it brings, and learning about treatments can help improve health and public awareness.

## **Aim of the Study**

This study aims to analyze the causes, health consequences, and available treatment methods for obesity in adults, providing a comprehensive overview of the current knowledge on the subject.

## **Materials and Methods**

This review utilized data from recent literature published over the last 15 years, sourced primarily from PubMed. The focus was on identifying and synthesizing information related to the epidemiology, risk factors, health consequences, and treatment strategies for adult obesity. Keywords such as "obesity," "adult," "treatment," "epidemiology," and "health consequences" were used to search relevant studies.

## **Conclusions**

Obesity in adults is a multifaceted issue requiring a comprehensive approach to treatment. Addressing this epidemic necessitates a combination of dietary changes, increased physical activity, behavioral therapies, pharmacological interventions, and surgical options when necessary. Ongoing support and monitoring are essential for achieving long-term success in weight management and improving overall health outcomes.

## **Keywords**

Obesity, Epidemiology, Health Consequences, Physical Activity, Pharmacotherapy, Bariatric Surgery.

## **Introduction**

Obesity is one of the most serious health problems in the modern world. In recent decades, the prevalence of obesity among adults has increased dramatically. It poses a serious threat to public health. Obesity is a cause of chronic diseases, including type 2 diabetes, cardiovascular disease and some cancers . This article aims to analyze the causes, consequences of physical health and mental health, show available treatments for obesity in adults.

## **Literature Review**

### **Global Situation**

Obesity has become a global health problem, affecting both developed and developing countries. The World Health Organization (WHO) reported that in 2016, over 1.9 billion adults aged 18 years and older were overweight, with more than 650 million classified as obese. This means that approximately 39% of adults worldwide were overweight, and 13% were obese. The prevalence of obesity among adults varies by region, with the highest rates observed in high-income countries.

### **Risk Factors and Causes of Adult Obesity**

Obesity is the result of a complex interaction between genetic, environmental, behavioral, and metabolic factors. Understanding these factors is crucial for developing effective prevention and treatment strategies. Below is a detailed review of the main risk factors associated with obesity in adults.

#### **Genetic Factors**

Genetic predispositions to obesity are well documented. Studies have shown that the heritability of obesity ranges from 40% to 70% [1]. Many genes are involved in regulating body weight, affecting mechanisms such as appetite control, fat storage, and energy metabolism. The most well-known gene associated with obesity is the FTO (fat mass and obesity-associated) gene, which influences appetite and food intake [2].

#### **Environmental Factors**

**Food Availability and Choices:** The food environment significantly affects the risk of obesity. In developed countries, there is widespread availability of cheap, highly processed, and calorie-dense foods. Fast food, sugary drinks, sweets, and snacks high in fats and sugars are easily accessible, promoting excessive calorie intake [3]. This problem doesn't only affect adults, but what's worse is that poor nutrition starts as early as the first years of life.

**Lifestyle and Physical Activity:** Lack of physical activity is one of the main risk factors for obesity. Modern lifestyles often involve sedentary behavior, both at work and during leisure time. Office work, long hours spent in front of the TV or computer, and limited recreational opportunities contribute to decreased energy expenditure [4]. From an early age, children increasingly avoid physical education classes. In later stages of life, there is also a lack of time for exercise. We prefer the couch potato model, which does not require us to engage.

**Urbanization and Infrastructure:** Urban residents are often more prone to obesity due to limited access to recreational areas, safe places to exercise and healthy foods. Urbanization is also associated with increased availability of fast food and reduced physical activity, car travel options [5].

### **Behavioral Factors**

**Diet:** Unhealthy eating habits, such as consuming large amounts of saturated fats, simple sugars, and highly processed foods, are major causes of excessive weight gain. Diets low in fiber, vegetables, fruits, and whole grains also promote obesity [6].

**Alcohol Consumption:** Excessive alcohol consumption is associated with a higher risk of obesity. Alcohol is calorific, and its excessive intake can lead to a positive energy balance [5].

**Sleep Behaviors:** Sleep deprivation and circadian rhythm disturbances can affect hormones that regulate appetite, such as ghrelin and leptin, leading to increased food intake and obesity [7].

### **Psychological Factors**

**Stress and Emotional Disorders:** Stress, depression, and other mental disorders can lead to unhealthy eating habits, such as emotional eating, which promotes excessive calorie intake and weight gain [8].

**Social Influences:** Social and cultural norms can influence eating habits and physical activity. Communities where large portion sizes and low physical activity are the norms have higher obesity rates [9].

## **Metabolic and Hormonal Factors**

**Hormonal Disorders:** Certain hormonal disorders, such as polycystic ovary syndrome (PCOS), hypothyroidism, and Cushing's syndrome, can lead to weight gain and obesity [10].

**Medications:** Some medications, such as antidepressants, antipsychotics, steroids, and beta-blockers, can lead to weight gain as a side effect [11].

## **Health Consequences of Obesity**

Obesity has a multifaceted impact on health, leading to numerous physical, metabolic, and psychological complications. Below is an overview of the major health consequences associated with obesity.

### **Cardiovascular Diseases**

Obesity is a strong risk factor for the development of cardiovascular diseases, including coronary artery disease, hypertension, myocardial infarction, and stroke. Excess adipose tissue, especially visceral fat, contributes to chronic inflammation, dyslipidemia (elevated triglycerides, decreased HDL, elevated LDL), and insulin resistance, increasing the risk of atherosclerosis and other cardiovascular complications [12].

### **Type 2 Diabetes**

One of the most serious consequences of obesity is the increased risk of developing type 2 diabetes. Obesity leads to insulin resistance, making the body less able to use insulin effectively to regulate blood glucose levels. As a result, the pancreas produces more insulin, which over time leads to its exhaustion and the development of type 2 diabetes. Studies show that obese individuals have up to a 10-fold higher risk of developing type 2 diabetes compared to individuals with normal body weight [13].

### **Respiratory Diseases**

Obesity also negatively affects respiratory function. Excess adipose tissue around the chest and abdomen can restrict diaphragm movement, leading to decreased lung volume and breathing difficulties. Obese individuals are more prone to developing obstructive sleep apnea,

characterized by interruptions in breathing during sleep, leading to hypoxia, fatigue, and an increased risk of cardiovascular diseases[14].

### **Joint Diseases**

Excess body weight increases the load on joints, especially the knees and hips, leading to their degeneration and the development of osteoarthritis (OA). Obesity is one of the main risk factors for OA, and weight loss can significantly reduce symptoms and improve joint function [15].

### **Cancer**

Obesity is associated with a higher risk of developing several types of cancer, including breast, endometrial, colorectal, kidney, and esophageal cancer. These mechanisms involve hormonal changes, chronic inflammation, and insulin resistance, which can influence cancer processes [3].

### **Mental Health**

Obesity can also negatively affect mental health, leading to low self-esteem, depression, and anxiety. Social stigma associated with excessive body weight and body image issues can lead to emotional and psychological disorders[16].

### **Liver Diseases**

Obesity increases the risk of developing non-alcoholic fatty liver disease (NAFLD), which can lead to liver inflammation, cirrhosis, and in extreme cases, liver cancer. NAFLD is currently the most common cause of chronic liver diseases in developed countries [17].

### **Impact of Obesity on Mental Health**

Obesity has a significant impact not only on physical health but also on mental health. Obese individuals often experience various psychological problems that can affect their quality of life and ability to cope with daily challenges [18].

## **Depression and Anxiety**

Studies show a strong link between obesity and the occurrence of depression and anxiety. Obese individuals are more prone to developing depressive disorders than those with normal body weight [19]. The reciprocal interaction between depression and obesity can create a vicious cycle where obesity leads to depression, and depression fosters further weight gain. These mechanisms may include biological factors such as hormonal disturbances and inflammation, as well as psychological aspects such as low self-esteem and negative thinking [20].

## **Stigmatization and Discrimination**

Stigma associated with obesity is common and can have serious consequences for mental health. Obese individuals often face discrimination in various areas of life, including workplaces, schools, and even healthcare. Stigmatization can lead to feelings of shame, guilt, and low self-esteem, which in turn can lead to psychological disorders such as depression and anxiety [21].

## **Quality of Life**

Obesity can significantly reduce the quality of life, affecting the ability to perform daily activities, interpersonal relationships, and professional activity. Obese individuals often experience physical limitations that can lead to frustration and a sense of helplessness. Additionally, negative social and emotional experiences can lead to social isolation and deteriorating mental health [22].

## **Eating Disorders**

Obesity is often associated with eating disorders such as bulimia nervosa and binge eating disorder (BED). Individuals with BED regularly experience episodes of binge eating during which they consume large amounts of food in a short time and feel a lack of control over eating. Such episodes can lead to further weight gain and exacerbation of psychological problems [23].



## **Self-Esteem and Body Image**

Negative self-perception is common among obese individuals and can lead to low self-esteem and lack of self-acceptance. Negative body image can be exacerbated by media and social norms regarding ideal body shape, further affecting mental health and well-being [24].

## **Treatment Methods for Adult Obesity**

Treating obesity requires a comprehensive approach that includes lifestyle modification, pharmacotherapy, and in some cases, surgical interventions. Each of these methods has specific advantages and limitations, and their effectiveness may vary depending on the individual characteristics of the patient. Below is a detailed overview of available treatment methods for obesity.

### **Lifestyle Modification**

#### **Diet and Nutrition**

Changing eating habits is a fundamental element of obesity treatment. An effective diet should be balanced, low-calorie, but still provide all necessary nutrients. Dietary recommendations include:

- Limiting the intake of saturated fats, simple sugars, and salt.
- Increasing fiber intake by consuming more vegetables, fruits, whole grains, and legumes.
- Regular meals, avoiding snacking, and portion control [25].

One popular approach is a low-carbohydrate diet, which can lead to rapid weight loss in the short term [26]. Another approach is the Mediterranean diet, rich in fruits, vegetables, nuts, fish, and olive oil, which is also effective in reducing weight and improving metabolic health [27].

#### **Physical Activity**

Regular physical activity is crucial in treating obesity. It is recommended to engage in at least 150 minutes of moderate or 75 minutes of intense physical activity per week, divided into sessions lasting at least 10 minutes . Types of activities include:

- Aerobics (running, swimming, cycling)
- Resistance exercises (weightlifting, resistance band exercises)
- Mixed exercises (high-intensity interval training - HIIT) [28].

### **Behavioral Therapy**

Changing behavioral habits is often necessary for sustainable weight loss. Behavioral therapies may include techniques such as:

- Self-monitoring (keeping a food diary)
- Setting realistic goals
- Stress management
- Cognitive-behavioral techniques that help change thinking and eating habits.[29][30]

### **Pharmacotherapy**

Pharmacotherapy is indicated for patients who have not achieved satisfactory results through lifestyle modifications, especially if they have a BMI  $\geq 30$  or a BMI  $\geq 27$  with accompanying health complications[31]. The most commonly used drugs include:

- **Orlistat:** A lipase inhibitor that reduces fat absorption from the diet. Efficacy: moderate weight loss . Orlistat is a lipase inhibitor that reduces fat absorption from the diet, leading to moderate weight loss. It works by inhibiting the action of gastric and pancreatic lipases, which are necessary for the breakdown of dietary fat. This reduction in fat absorption can aid in weight management [32].
- **Liraglutide:** A GLP-1 (glucagon-like peptide-1) analog that increases satiety and decreases appetite. These medications, such as liraglutide and exenatide, have shown significant efficacy in promoting weight loss and improving metabolic parameters, including glycemic control and lipid profiles.

Mechanism: GLP-1 analogs work by mimicking the incretin hormone, which enhances insulin secretion, suppresses glucagon release, delays gastric emptying, and increases feelings of fullness (satiety), thereby reducing overall food intake.

Efficacy: Studies have demonstrated that GLP-1 analogs lead to significant weight loss and improvements in metabolic health. For example, patients treated with exenatide showed weight loss ranging from 2 to 6 kg and improved insulin sensitivity and glycemic control [33],[34].

- **Phentermine/topiramate:** A combination that reduces appetite and increases satiety, leading to significant weight loss, is a GLP-1 analog such as liraglutide or exenatide. These medications work by mimicking the incretin hormone GLP-1, enhancing insulin secretion, suppressing glucagon release, delaying gastric emptying, and increasing feelings of fullness. Studies have shown these medications result in significant weight loss and improvement in metabolic parameters [35].
- **Naltrexone/bupropion:** Naltrexone/bupropion is a combination medication used to aid in weight loss by acting on the central nervous system to decrease appetite and increase satiety. Clinical studies have shown that this combination can lead to moderate weight loss and improvements in metabolic health parameters [36].

Pharmacotherapy should be used in combination with lifestyle modification and under medical supervision to monitor side effects and adjust treatment to the patient's individual needs.

## **Bariatric Surgery**

Bariatric surgery is the most effective treatment method for patients with morbid obesity (BMI  $\geq 40$ ) or BMI  $\geq 35$  with health complications who have not achieved satisfactory results through lifestyle modification and pharmacotherapy [37]. The most commonly performed procedures include:

- **Gastric bypass (Roux-en-Y):** Gastric bypass, specifically Roux-en-Y gastric bypass (RYGB), involves creating a small gastric pouch and connecting it directly to the small intestine. The procedure is highly effective in achieving significant and sustained weight loss and improving metabolic parameters. Studies have shown that

RYGB leads to significant and sustained weight loss and improved cardiometabolic parameters in obese individuals. Studies confirm the procedure's effectiveness in improving insulin sensitivity and beta cell function, leading to early and long-term metabolic improvements, especially in patients with type 2 diabetes [38]. Another study published in BMC Surgery found that RYGB was associated with significant weight loss and a reduction in comorbidities [39].

- **Sleeve gastrectomy:** Sleeve gastrectomy involves the surgical removal of a portion of the stomach, reducing its volume significantly. This procedure is known for its efficacy in achieving substantial weight loss and improving metabolic health. Studies have shown that sleeve gastrectomy results in significant weight loss and improvement in obesity-related comorbidities such as type 2 diabetes, hypertension, and dyslipidemia [40].
- **Adjustable gastric banding** Adjustable gastric banding (AGB), also known as laparoscopic adjustable gastric banding (LAGB), involves placing an adjustable band around the upper part of the stomach to create a small pouch. This procedure reduces the stomach's capacity, leading to decreased food intake and promoting a feeling of fullness after consuming smaller portions. It is a minimally invasive surgical procedure designed to treat obesity and is known for achieving moderate weight loss.

Studies have shown that AGB can result in an average loss of 45% of excess weight and can improve conditions such as type 2 diabetes and hypertension. This procedure is particularly suited for patients who can commit to long-term dietary changes and follow-up care. However, it is generally considered less effective for weight loss compared to other bariatric procedures like gastric bypass or sleeve gastrectomy [41].

Bariatric surgery leads to significant and durable weight loss and improvement or remission of many health complications associated with obesity, such as type 2 diabetes, hypertension, and dyslipidemia. However, like any surgery, it carries risks of complications and requires long-term monitoring and support [42].

## **The Impact of Physical Activity on Obesity Treatment**

Physical activity plays a key role in the treatment and prevention of obesity. Regular physical exercise helps not only in weight loss but also in improving overall health, reducing the risk of chronic diseases, and enhancing mental well-being.

## **Health Benefits of Physical Activity**

**Reduction of Body Weight and Fat Tissue:** Regular physical activity increases energy expenditure, contributing to a calorie deficit and weight loss. Aerobic exercises, such as running, cycling, swimming, and brisk walking, are particularly effective in burning calories and reducing fat tissue [43].

**Improvement of Metabolic Parameters:** Regular physical activity is essential for improving insulin sensitivity, a critical factor in preventing and managing type 2 diabetes. Studies have shown that both aerobic exercises (such as running, cycling, swimming, and brisk walking) and resistance training significantly enhance the body's ability to use insulin effectively. This improvement helps regulate blood glucose levels, preventing the spikes and drops that characterize diabetes. Moreover, exercise plays a pivotal role in managing lipid profiles by increasing HDL (good cholesterol) and decreasing LDL (bad cholesterol) and triglycerides, thereby reducing the risk of atherosclerosis and other cardiovascular diseases. Blood pressure regulation is another significant benefit of regular exercise, as it helps maintain a healthy vascular system and reduces the strain on the heart. In a study published in *Diabetes Care*, researchers found that resistance training notably improves insulin sensitivity in non-obese type 2 diabetic patients without affecting maximal oxygen uptake, emphasizing its specific benefits independent of aerobic capacity [44].

**Increase in Muscle Mass:** Increasing muscle mass through resistance exercises, such as weightlifting and resistance band workouts, plays a significant role in enhancing the basal metabolic rate (BMR). This increase in muscle mass means that the body burns more calories even at rest. Studies show that the addition of muscle mass through strength training can lead to a higher BMR because muscle tissue is metabolically more active compared to fat tissue. Regular physical activity, especially high-volume resistance training, has been shown to significantly improve insulin sensitivity in individuals with type 2 diabetes, contributing to better glucose regulation, lipid profiles, and blood pressure control. These improvements help reduce the risk of cardiovascular diseases [45],[46].

**Improvement of Mental Health:** Regular physical activity has a positive impact on mental health, significantly reducing symptoms of depression, anxiety, and stress. Exercise improves mood, sleep quality, and overall well-being by promoting the release of endorphins and other neurotransmitters that enhance mood and relaxation. A systematic review of longitudinal observational studies highlighted the mental health benefits of physical activity, emphasizing its role in enhancing emotional resilience and reducing psychological distress. These findings underline the importance of incorporating regular exercise into daily routines for better mental health outcomes [9].

**Reduction of Obesity Recurrence Risk:** Regular physical activity is crucial for maintaining weight loss and preventing the recurrence of obesity. Studies have demonstrated that individuals who continue physical activity after losing weight are more likely to maintain their weight loss over the long term. This ongoing exercise helps sustain metabolic improvements and reduces the risk of regaining weight [47].

## **Recommendations for Physical Activity**

Health organizations, including the American College of Sports Medicine (ACSM), recommend adults engage in at least 150 minutes of moderate-intensity aerobic physical activity per week. This can be divided into sessions lasting at least 10 minutes each. For even greater health benefits, it is recommended to increase this to 300 minutes of moderate-intensity or 150 minutes of vigorous-intensity aerobic activity per week. Additionally, muscle-strengthening activities should be performed on two or more days a week.

These guidelines are based on extensive scientific evidence showing that regular physical activity significantly improves overall health, including reducing the risk of chronic diseases such as cardiovascular disease, type 2 diabetes, and certain cancers. Regular exercise also enhances mental health, helping to alleviate symptoms of depression and anxiety, and improves sleep quality and cognitive function. ([health.gov](https://www.health.gov))

## **Types of Physical Activity:**

- **Aerobic Exercises:** Examples include running, swimming, cycling, dancing, and brisk walking. These are effective in improving cardiorespiratory fitness and burning calories.
- **Resistance Exercises:** Exercises using weights, resistance bands, or body weight, which help build muscle mass and improve strength.
- **Flexibility and Stretching Exercises:** Yoga, Pilates, and stretching help improve flexibility, reduce injury risk, and enhance range of motion.

## **Support in Integrating Physical Activity**

Regular physical activity is crucial in maintaining weight loss and preventing obesity recurrence. Studies indicate that individuals who maintain physical activity after losing weight are more likely to sustain their weight loss over the long term. Support mechanisms such as educational programs, support groups, individual coaching, and progress monitoring

can significantly enhance the chances of success in long-term weight management [48]. Additionally, incorporating social support through educational programs, support groups, and individual coaching can significantly enhance the success of long-term weight management. Studies have shown that such supportive measures increase motivation, adherence to healthy behaviors, and overall success in maintaining weight loss [49].

## **Conclusion**

Obesity among adults is a complex and multifaceted issue that poses serious health risks and challenges. The prevalence of obesity has increased dramatically around the world, affecting both developed and developing countries. The causes of obesity are diverse and include genetic, environmental, behavioral and metabolic factors. Genetic predisposition plays an important role, with heritability estimates ranging from 40% to 70%. Environmental factors, such as the availability of high-calorie foods, sedentary lifestyles and urbanization, further exacerbate the situation. Behavioral factors, including poor diet, excessive alcohol consumption and insufficient sleep, also contribute significantly to weight gain. The health consequences of obesity are serious and extensive, affecting nearly every system in the body. Obesity increases the risk of cardiovascular disease, type 2 diabetes, respiratory disorders, joint disease, various cancers and mental disorders. These complications not only reduce quality of life, but also increase mortality among obese people. Effective management and treatment of obesity requires a comprehensive approach. Lifestyle modifications, including dietary changes and increased physical activity, are foundational. Pharmacotherapy offers additional support for individuals who do not achieve sufficient weight loss through lifestyle changes alone. Bariatric surgery provides a more drastic but highly effective option for individuals with severe obesity. Recent advancements in obesity treatment focus on novel pharmacological agents and combination therapies that target multiple pathways involved in appetite regulation and metabolism. These new treatments, along with traditional methods, offer hope for more effective management of obesity. By understanding the complex interplay of factors contributing to obesity and implementing comprehensive treatment plans, it is

possible to improve health outcomes and reduce the burden of obesity on individuals and healthcare systems globally.

### **Author's contribution**

Conceptualization, Joanna Jakubiec; methodology, Joanna Jakubiec and Julita Gmitrzuk; software, Tomasz Kucharski and Martyna Opatowska; check, Katarzyna Wiśniewska; Maciej Karasiński; formal analysis, Joanna Jakubiec and Zuzanna Malinka; investigation, Joanna Jakubiec and Anna Jachymek; resources, Martyna Opatowska and Tomasz Kucharski; data curation, Julita Gmitrzuk, Katarzyna Wiśniewska; writing – rough preparation, Joanna Jakubiec; writing - review and editing, Joanna Jakubiec and Maciej Karasiński; visualization, Joanna Jakubiec, Zuzanna Malinka and Anna Jachymek; supervision, Julita Gmitrzuk and Maciej Karasiński; project administration, Joanna Jakubiec, Tomasz Kucharski. All authors have read and agreed with the published version of the manuscript.

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The authors of the paper report no conflicts of interest.

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