

Obesity-a review

Swathi Vutukuri^{1*}, J.N. Suresh Kumar², M. Harika³, SK. Nagurbi³, S. Suchitra³, V. Tharuni³, P. Kethana Kumari³

¹Associate Professor, Department of Pharmacology, Narasaraopeta Institute of Pharmaceutical Sciences, Narasaraopet, A.P., India.

²Professor and Principal, Department of Pharmaceutics, Narasaraopeta Institute of Pharmaceutical Sciences, Narasaraopet, A.P., India.

³Department of Pharmacy, Narasaraopeta Institute of Pharmaceutical Sciences, Narasaraopet, A.P., India.

*Correspondence

Swathi Vutukuri

swathi.pharmabud@gmail.com

Volume: 2, Issue: 4, Pages: 12-18

DOI: <https://doi.org/10.37446/corbio/ra/2.4.2024.12-18>

Received: 19 September 2024 / Accepted: 28 November 2024 / Published: 31 December 2024

Obesity is an excessive accumulation of body fat, often induced by a BMI of 30 or higher. It increases the risk of health issues like heart disease and diabetes and is influenced by genetics, environment, and lifestyle choices. Obesity is an intricate, multifactorial medical illness that presents substantial dangers to general health and is characterized by an excessive buildup of body fat. Increased risk of many chronic illnesses such as type-2 diabetes, cardiovascular diseases, certain malignancies and musculoskeletal disorders, has been connected to the syndrome. The etiology of obesity beside behavioral, environmental and hereditary factors. Modern lifestyles, marked by increased sedentary behavior and high-calorie, low-nutrient diets, exacerbate the risk of developing obesity. Addressing obesity requires a multifaceted approach including lifestyle modifications, dietary changes, physical activity and in some cases, pharmacological or surgical interventions. Prevention strategies exploit good diet and regular exercise. Effective management and prevention of obesity are crucial for reducing its burden on individuals and healthcare systems globally.

Keywords: obesity, lifestyle modifications, management and prevention

Introduction

Recent investigations conducted in various domains of psychology revealed that body image concerns with development and maintenance of eating disorders and obesity. Prominent scholars currently hold the view that evaluating and addressing body image concerns ought to be essential components of diagnosing and treating eating disorders and obesity. Examining in briefly the specific roles played by gender and ethnicity in eating disorders and body image is a secondary objective.

To combat the rise in obesity incidence worldwide, the International Obesity Task Force (IOTF) was founded in 1994. The IOTF's objectives are to

- Make people and governments aware that obesity is a dangerous medical condition.
- Provide guidelines and recommendations for a logical and successful global strategy for the control and prevention of obesity.
- Put into practice the necessary measures to control and prevent obesity globally (Thompson, 2001).

BMI (body mass index)

The BMI value is determined by the division of the weight of a person in kg to square of height of the person in meters. The standard BMI values and category of patients are used to segregate the population. It is a common tool employed widely in segregating the population (Dietz & Bellizzi, 1999).

Management of obesity and overweight

Healthcare professionals generally assist patients with overweight or obese to change their lifestyle that can safely help to lose excess weight and maintain that loss over time. In certain cases, additional treatments like weight-loss medications or surgical options may also be preferred (Kahan, 2016).

1. Management of the patients with obesity

The global obesity rates are on the rise, necessitating the implementation of preventive measures to mitigate the associated health and financial consequences. Financial and technological changes in the environment have contributed to the obesity epidemic. Numerous studies have examined strategies in schools, workplaces and communities that may stop the rise in BMI. Treatment is necessary when obesity prevention is ineffective. Several guidelines have been fabricated to help healthcare practitioners treat obesity effectively for glycemic management and lowering the chance of getting type-2 diabetes (Kahan, 2016).

Surgical treatment for obesity

The adoption of bariatric surgery as a treatment for severe obesity has rapidly increased, following the advent of lower risk laparoscopic since 2013 with approximately 500,000 surgeries conducted worldwide. Several established methods available for weight loss; each technique carries its own risks and benefits that must be thoroughly evaluated for each individual patient. Long-term studies on the outcomes of bariatric surgery have generally yielded favorable results (Bult et al., 2008).

Adverse effects on conception and implantation on obesity

Modern civilization witnessed an increase in the health burden due to obesity. Most obese women do not experience fertility. Obesity's detrimental effects on fecundity and fertility is three times more common in obese women than in normal body mass index (BMI) women. In both natural and aided conception cycles, obese women have reduced productiveness. One feature of obesity is the accumulation of extra fat affecting gonadal functions (Norman, 2010)

Health risks of obesity and overweight

Numerous health issues arise from being overweight or obese. Obesity has no age limit. Majority of the teenagers, children and women are suffering from these obesity problems due to their overweight. The underlying reason behind the obesity is lifestyle and food including genetics. Obesity is the major reason for disease progression. Minor changes in lifestyle and maintaining healthy weight can prevent obesity and their related problems (khan Afridi et al., 2003).

The following are the co-morbidities associated with obesity.

Diabetes mellitus-2

Diabetes mellitus-2 is a condition fostered due to excessive blood glucose levels. Approximately 90% of individuals diagnosed with type 2 diabetes are obese. Long duration of elevated blood sugar may cause renal diseases, nerve damage, heart problems, stroke, and other health issues. To avert one should lose 5-7% of actual weight (Garber, 2012).

Hypertension

Hypertension also called high blood pressure, a condition that affects pressure with which the blood is flown in blood vessels. People with obesity also suffer from hypertension, due to the pressure created by blood vessels to pump blood to different parts of body. Obesity also alters kidneys function in regulating heart rate and blood pressure. Hypertension results in increased risk of heart attacks, stroke, ischemic heart disease and renal damages resulting death. Reducing body fat sufficiently prevents and lowers hypertension that prevents and controls health related issues. (Zhou et al., 2009).

Stroke

Stroke characterized due to blockage of blood vessels due to deposition of cholesterol in the brain and neck (or) bursting of blood vessels. Stroke can cause damage to brain tissue and impair speech leading to paralysis. Overweight and

obesity exacerbate hypertension, which is the primary cause of stroke. Blood hypertension, high blood sugar, high cholesterol and other stroke risk factors can be lowered by losing weight ([Rashid et al., 2003](#); [Shinton et al., 1995](#)).

Hepatic steatosis

Severe damage of the liver that includes non-alcoholics. Non-alcoholic steatohepatitis (NASHS) can mostly affect people who are suffering from obesity and overweight. People who have high insulin resistance, high blood pressure, metabolic syndrome, and type 2 diabetes can enhance non-alcoholic fatty disease (NAFLD) and non-alcoholic steatohepatitis (NASH). A few are:

1. **NAFLD/NASHS:** Fat accumulation in the liver can lead to inflammation, fibrosis and eventually cirrhosis. This can affect liver function and overall health.
2. **Metabolic syndrome:** Obesity often associated with metabolic syndrome, which includes insulin resistance, hypertension, and dyslipidemia. This syndrome increases the risk of cardiovascular diseases, including stroke.
3. **Cerebrovascular risk:** Liver dysfunction can contribute to increase stroke risk, such as increased inflammation and changes in coagulation.
- 4.

In severe cases, liver disease can lead to confusion, altered mental status, or hepatic encephalopathy, which might resemble stroke symptoms ([Marchesini et al., 2008](#)).

Metabolic disorder:

Obesity is characterized by disorder in metabolism that alters BMI. Metabolic disorder raises the chances of heart problems, diabetes, and stroke. The most common indications observed due to imbalance in metabolic disorder are: Huge abdomen estimations, Hypertension, Increased blood sugar with low levels of HDL cholesterol and High levels of triglycerides in blood.

The metabolic disorder can be reduced by making solid way of life alternations that help with weight control ([Bitzur et al., 2016](#)).

Obesity-related cancers

Obesity is also one of the underlying factors causing cancer. Corpulence and overweight may increase the hazard of getting a few cancers. Obese males are more likely to be infected with prostate, colon and rectum cancers. Obese females are incident with cancers of the breast, uterine lining and bladder. ([Jubber, 2004](#); [Krupa-Kotara & Dakowska, 2021](#)).

Osteoarthritis

Osteoarthritis is a common and long-lasting health condition that leads to pain, swelling, stiffness with restricted movements in the joints and it is mainly linked to obesity. Excess weight or being obese causes extra pressure on your joints and cartilage, potentially increasing your likelihood of developing osteoarthritis. Having extra body fat may result in higher levels of inflammatory substances in your blood that further contribute to joint inflammation and the risk of osteoarthritis ([Kulkarni et al., 2016](#)).

Mental stability problems

Obesity can affect mental well-being increasing the likelihood of various physical health problems. Research indicates that individuals with obesity face a greater weight-related discrimination in professional and educational settings that may adversely affect their overall quality of life. The main psychological complications associated with obesity are: Persistent anxiety, Difficulties with body perception, Low self-esteem, consuming disorder and feeling of sadness. Shedding excess weight enhances one's own body and lessens depressive symptoms ([Devlin et al., 2000](#)).

Female infertility problems

Hormonal changes in ovaries results less estrogen and progesterone, leading to various physical and emotional symptoms like night sweats, mood changes, sleep disturbances, vaginal changes, perimenopause and post-menopause ([Talmor & Dunphy, 2015](#)). Managing obesity during menopause involves specific strategies that address the unique challenges women face during this transition. (Nutritional adjustment, physical activity behavioral strategies,

psychological support and medicinal interventions). PCOS (polycystic ovarian syndrome) is characterized by elevated levels of androgen (male hormone) leading to weight gain. This weight gain further increases insulin resistance, worsening hormonal imbalance. Obesity can further disrupt the menstrual cycle in individuals especially with PCOS making it more irregular or absent. Symptoms like acne and hirsutism (excess hair growth and scalp hair thinning) may become more pronounced with increased body weight. Preeclampsia or elevated blood pressure during pregnancy and eclampsia in more severe cases, are common complications of pregnancy due to obesity. Diabetes during pregnancy, commonly known as gestational diabetes, also instigated by obesity besides insulin resistance. Obese women have lower odds of successful pregnancies because obesity increases the risk of miscarriage. The reasons behind are: Inadequate implantation or reception of the fertilized egg in to the womb, primarily as a result of insulin resistance, Poor quality egg/ ovum and Hormonal imbalances and abnormalities essential for maintenance of pregnancy. Obesity affects the endometrium (uterine lining) mainly through increased estrogen levels, as excess fat tissue converts androgens into estrogen. This can lead to endometrial hyperplasia, where the lining thickens, increasing the risk of endometrial cancer. Obesity also contributes to insulin resistance and inflammation, which can further stimulate the endometrium and affect menstrual cycles. Women with obesity are at higher risk of irregular periods, fertility issues and miscarriage. Weight loss and hormonal treatments can help reduce these risks (Talmor & Dunphy, 2015).

Excess weight causes insomnia

Individuals with obesity are more likely to experience insomnia with underlining medical issues. Increased belly circumference due to deposition of extra fat can compress the chest wall that lowers lung capacity. Decreased lung capacity may increase the risk of upper airway collapse especially during sleep. During sleep, upper respiratory track is relaxed resulting in accumulation of fat. Anatomical characteristics like acid reflux, pulmonary disorders, heart issues, larger tonsils that obstruct the airway are less prevalent causes for sleep apnea (Shah & Roux, 2009).

Overview of Male obesity

Obesity in men ensues infertility, erectile dysfunction and hypogonadism. Numerous epidemiological studies have found a positive link between male hypogonadism and obesity, suggesting that increasing body mass is the main cause of gonadal dysfunctions. Visceral obesity in males is more dangerous than central obesity. It results in ensuing growth factors, hormones and adipokines. Infiltration of macrophages is more in male adipose tissue resulting inflammation and increased levels of leptin. Male obesity results in stoke, fatty liver disease, type-II diabetes mellitus, obstructive sleep apnoea, hypogonadism, hyperventilation syndrome, erectile dysfunction and infertility (Barber et al., 2024; Carrageta et al., 2019; Fernandez et al ., 2019; Guerra-Carvalho et al ., 2022).

Childhood obesity:

Childhood obesity, a medical condition where a child has unhealthy amount of body fat, often measured using body mass index (BMI) and is associated with increased risk of health problems like diabetes heart disease and joint pains. The origins of childhood obesity are sweetened drinks, snacks, size portion, level of activity, environmental elements and socio-cultural elements. The physiological factors are anxiety and depression, self-worth, body discontent, symptoms of eating disorder and emotional issues. Childhood obesity is also a prime reason for early incidence with diseases (Clegg & Woods, 2004; Lee et al., 2019; Papoutsis et al., 2013; Sahoo et al., 2015).

Geriatric obesity

Geriatric obesity refers to excessive body fat in older adults (typically aged 65 and older), which can lead to chronic health diseases, mobility problems with decreased quality of life. The reasons behind are decline in metabolism, reduced physical activity, change in appetite and hormones, muscle loss, poor diet, chronic diseases and age related changes in body. Geriatric obesity results increased joint pain, shortness of breath, increased risk of cardiovascular diseases, sleep apnea, decreased mobility, diabetes, fatigue and low energy, depression and anxiety, digestive problems, cancer, poor skin health, cognitive decline and urinary incontinence (Malenfant & Batsis, 2019; Shebl et al., 2015).

Genetic obesity

Genetic obesity refers to obesity influenced due to person's genetic makeup. Individuals inherit genes make them more likely to gain weight, affect fat storage, metabolism and hunger regulation. This is due to genetic mutations in MC4R gene. Genetic factors increase the risk, environmental and lifestyle choices (like diet and exercise) also play a role in whether someone becomes obese. The table listed below indicates the genes, their role and defects raised due to abnormalities (Farooqi & O'RAHILLY, 2013; Loos & Bouchard, 2003).

Table 1. Table showing reasons for genetic obesity indicating gene name, functional role and abnormality symptoms.

S.No	Gene name	Functional role	Abnormality symptoms
1.	propiomelanocortin (POMC)	Inhibition of appetite, regulates the stress responses.	hunger regulation, adrenal insufficiency, electrolyte imbalance, glucose metabolism, pigment and obesity
2.	melanocortin-4 (MC4R)	Appetite regulation, homeostasis, thermoregulation, and dietary consumption	Obesity, insulin resistance, energy balance, mutation, metabolic dysfunction.
3.	Prader-willi syndrome (PWS)	Regulating growth, metabolism and appetite, thirst and emotional responses regulation.	Sleep disorder, delayed puberty, severe obesity, behavioral and psychiatric symptoms.
4.	Alstrom hallgren syndrome (ALMS)	energy metabolism, fat formation, growth and development.	Obesity and metabolic issues, abnormal lipids, vision and hearing problems, behavioral issues.
5.	Downward syndrome (DS)	Cognitive and intellectual development, social skills, low muscle tone, joint flexibility, speech and language development.	Difficulty in swallowing, reduces energy expenditure, reasoning and learning abilities and diminishes physical activity

Obesity and thyroid function

Obesity and thyroid function are interconnected as thyroid gland plays a key role in regulating metabolism and body weight. Hypothyroidism (underactive thyroid) leads to weight gain by slowing down metabolism. Hyperthyroidism (overactive thyroid) can cause weight loss by speeding up metabolism. Thyroid disorder is linked to variations in body temperature, body composition and total energy expenditure during rest, separate from physical activity. Furthermore, following thyroid dysfunction and weight gain is ensued. Hyperthyroidism, both overt and subclinical, is commonly linked to decrease metabolic rate, weight gain and decrease thermogenesis. A recent cross-sectional population-based study found that both overt and sublingual hypothyroidism were associated with higher BMIs and higher rates of obesity in both smokers and nonsmokers ([Reinehr, 2010](#); [Witkowska-Sędek et al., 2017](#)).

Conclusion

Obesity is a complex and multifaceted condition influenced by a combination of genetic, environmental, behavioural and societal factors. Addressing obesity requires a comprehensive approach that includes promoting healthy eating habits, increasing physical activity and implementing supportive policies and environments. Effective management and prevention strategies also consider individual differences and be tailored to meet diverse needs. Collaborative efforts involving individuals, healthcare professionals, communities and policymakers are essential for tackling this significant public health issue and improving overall well-being.

Acknowledgement

I would like to acknowledge the professor and principal of Narasaraopeta institute of pharmaceutical sciences Dr.J.N.Suresh Kumar for his valuable support.

Author contributions

M. Harika, SK. Nagurbi, S. Suchitra, V.Tharuni, P.Kethana Kumari are the authors who worked in writing the original draft. Swathi Vutukuri acted as guide, analyst, reviewing the article and drafting. J.N.Suresh Kumar acted as supervisor and final reviewer for the article.

Funding

No funding.

Conflict of interest

The author declares no conflict of interest. The manuscript has not been submitted for publication in any other journal.

Ethics approval

Not applicable.

AI tool usage declaration

No AI tools have been used in manuscript preparation.

References

- Barber, T. M., Kabisch, S., Pfeiffer, A. F., & Weickert, M. O. (2024). Dietary and lifestyle strategies for obesity. *Nutrients*, 16(16), 2714.
- Bitzur, R., Brenner, R., Maor, E., Antebi, M., Ziv-Baran, T., Segev, S., . . . Kivity, S. (2016). Metabolic syndrome, obesity, and the risk of cancer development. *European journal of internal medicine*, 34, 89-93.
- Bult, M. J., van Dalen, T., & Muller, A. F. (2008). Surgical treatment of obesity. *European journal of endocrinology*, 158(2), 135-145.
- Carrageta, D. F., Oliveira, P. F., Alves, M. G., & Monteiro, M. P. (2019). Obesity and male hypogonadism: Tales of a vicious cycle. *Obesity Reviews*, 20(8), 1148-1158.
- Clegg, D. J., & Woods, S. C. (2004). The physiology of obesity. *Clinical obstetrics and gynecology*, 47(4), 967-979.
- Devlin, M. J., Yanovski, S. Z., & Wilson, G. T. (2000). Obesity: what mental health professionals need to know. *American Journal of Psychiatry*, 157(6), 854-866.
- Dietz, W. H., & Bellizzi, M. C. (1999). Introduction: the use of body mass index to assess obesity in children. *The American journal of clinical nutrition*, 70(1), 123S-125S.
- Farooqi, S., & O'RAHILLY, S. (2013). Genetic syndromes associated with obesity. *Endocrinology Adult and Pediatric: Diabetes Mellitus and Obesity E-Book*, 25.
- Fernandez, C. J., Chacko, E. C., & Pappachan, J. M. (2019). Male obesity-related secondary hypogonadism—pathophysiology, clinical implications and management. *European endocrinology*, 15(2), 83.
- Garber, A. (2012). Obesity and type 2 diabetes: which patients are at risk? *Diabetes, Obesity and Metabolism*, 14(5), 399-408.
- Guerra-Carvalho, B., Alves, M. G., & Oliveira, P. F. (2022). Obesity and Male Infertility: An Overview. *Int J Diabetol Vasc Dis Res*, 8(1e), 1-3.
- Jubber, A. S. (2004). Respiratory complications of obesity. *International journal of clinical practice*, 58(6), 573-580.
- Kahan, S. (2016). Overweight and obesity management strategies. *Am J Manag Care*, 22(7 Suppl), s186-196.
- khan Afridi, A., Safdar, M., Khattak, M. M. A. K., & Khan, A. (2003). Health risks of overweight and obesity-An over view. *Pakistan Journal of Nutrition*, 2(6), 350-360.
- Krupa-Kotara, K., & Dakowska, D. (2021). Impact of obesity on risk of cancer. *Central European Journal of Public Health*, 29(1), 38-44.
- Kulkarni, K., Karssiens, T., Kumar, V., & Pandit, H. (2016). Obesity and osteoarthritis. *Maturitas*, 89, 22-28.

- Lee, A., Cardel, M., & Donahoo, W. T. (2019). Social and environmental factors influencing obesity. *Endotext [Internet]*.
- Loos, R. J., & Bouchard, C. (2003). Obesity—is it a genetic disorder? *Journal of internal medicine*, 254(5), 401-425.
- Malenfant, J. H., & Batsis, J. A. (2019). Obesity in the geriatric population—a global health perspective. *Journal of global health reports*, 3, e2019045.
- Marchesini, G., Moscatiello, S., Di Domizio, S., & Forlani, G. (2008). Obesity-associated liver disease. *The Journal of Clinical Endocrinology & Metabolism*, 93(11_supplement_1), s74-s80.
- Norman, J. E. (2010). The adverse effects of obesity on reproduction. *Reproduction*, 140(3), 343-345.
- Papoutsis, G. S., Drichoutis, A. C., & Nayga Jr, R. M. (2013). The causes of childhood obesity: A survey. *Journal of Economic Surveys*, 27(4), 743-767.
- Rashid, M. N., Fuentes, F., Touchon, R. C., & Wehner, P. S. (2003). Obesity and the risk for cardiovascular disease. *Preventive cardiology*, 6(1), 42-47.
- Reinehr, T. (2010). Obesity and thyroid function. *Molecular and cellular endocrinology*, 316(2), 165-171.
- Sahoo, K., Sahoo, B., Choudhury, A. K., Sofi, N. Y., Kumar, R., & Bhadoria, A. S. (2015). Childhood obesity: causes and consequences. *Journal of family medicine and primary care*, 4(2), 187-192.
- Shah, N., & Roux, F. (2009). The relationship of obesity and obstructive sleep apnea. *Clinics in chest medicine*, 30(3), 455-465.
- Shebl, A. M., Hatata, E. S. Z., Boughdady, A. M., & El-Sayed, S. M. (2015). Prevalence and Risk Factors of Obesity among Elderly Attending Geriatric Outpatient Clinics in Mansoura City. *Journal of Education and Practice*, 6(30), 136-147.
- Shinton, R., Sagar, G., & Beevers, G. (1995). Body fat and stroke: unmasking the hazards of overweight and obesity. *Journal of Epidemiology & Community Health*, 49(3), 259-264.
- Talmor, A., & Dunphy, B. (2015). Female obesity and infertility. *Best practice & research Clinical obstetrics & gynaecology*, 29(4), 498-506.
- Thompson, J. K. (2001). Introduction: Body image, eating disorders, and obesity--an emerging synthesis.
- Witkowska-Sędek, E., Kucharska, A., Rumińska, M., & Pyrżak, B. (2017). Thyroid dysfunction in obese and overweight children. *Endokrynologia Polska*, 68(1), 54-60.
- Zhou, Z., Hu, D., & Chen, J. (2009). Association between obesity indices and blood pressure or hypertension: which index is the best? *Public health nutrition*, 12(8), 1061-1071.