



Exploring The Obesity Risks of Ultra-Processed Diets

Dr.S. Sathiya Narayana Murthy¹, Dr. Uthamalingam Murali² and Dr. Shilpa Bhargava³

¹Associate professor, Department of Anatomy, Shri Sathya Sai Medical College Research institute, SBV Chennai campus, SBV university.

² Professor of Surgery, Manipal University College Malaysia, Melaka, Malaysia

³ Assistant Professor, HOD of Science Department Biyani Girls College, Jaipur.

Abstract: Obesity is a multifaceted illness linked to numerous pathological conditions, including diabetes, coronary heart disease, stroke, hypertension, and certain cancers such as those of the colon, breast, and prostate. With mortality estimates ranging from 105,000 to 405,000 annually and healthcare costs between \$138 to \$210 billion, obesity has become a major preventable cause of death. This epidemic stems from various factors, including rising income levels, sedentary lifestyles, technological advancements in food production, and the proliferation of fast food. Additional contributors include shifting time preferences, marketing strategies promoting unhealthy foods, and accessibility of health insurance. The review examines the role of ultra-processed foods (UPFs) in contributing to obesity and its related disorders. Ultra-processed foods, rich in sugars, salt, protein isolates, high-fructose syrups, and various additives, dominate modern diets. Their affordability, convenience, and enhanced sensory appeal drive their widespread consumption, especially in nations like the US, UK, and Canada, where UPFs account for over half of daily caloric intake. This over-reliance on UPFs results in nutritionally deficient diets, low in fiber and essential nutrients but high in calories, saturated fats, sugar, and salt. The objective is to explore the categorization of obesity, its associated phenotypes, and the health consequences of UPF consumption, including neurodegenerative conditions, diabetes, and cardiovascular diseases. Public health strategies aimed at reducing UPF consumption, promoting nutritional awareness, and overcoming implementation challenges will be evaluated to address this growing epidemic.

Keywords: Ultra-processed foods (UPFs), Obesity and related disorders, Nutritional habits, Public health implications

*Corresponding Author

Dr.S. Sathiya Narayana Murthy , Associate professor,
Department of Anatomy, Shri Sathya Sai Medical College
Research institute, SBV Chennai campus, SBV university

Date of Receiving 26 November 2024

Date of Revision 2 December 2024

Date of Acceptance 3 January 2025

Date of Publishing 17 January 2025

Funding This research did not receive any specific grant from any funding agencies in the public, commercial or not for profit sectors.

Citation Dr.S. Sathiya Narayana Murthy, Dr. Uthamalingam Murali and Dr. Shilpa Bhargava , Exploring The Obesity Risks of Ultra-Processed Diets.(2025).Int J Pharm Sci.16(1), b8-15 <http://dx.doi.org/10.22376/ijpbs.2025.16.1.b8-15>

This article is under the CC BY- NC-ND Licence (<https://creativecommons.org/licenses/by-nc-nd/4.0>)

Copyright @ International Journal of Pharma and Bio Sciences, available at www.ijpbs.net

Int J Pharma Bio Sci., Volume16., No 1 (January) 2025, pp b8-15



1. INTRODUCTION

Obesity is a complex multifactorial illness associated with an array of pathological conditions, including diabetes, coronary heart disease, stroke, hypertension, and certain cancers of the colon, breast, and prostate¹. With estimates ranging from 105,000 to 405,000 fatalities per year, it has emerged as one of the major avoidable causes of mortality. Furthermore, obesity-related healthcare costs have increased dramatically, from \$138 to \$210 billion². This epidemic is caused by several variables, including increased income levels, technological developments in the food business, a rise in sedentary lifestyles, and accessibility of fast food alternatives. Other factors include changes in time choices, increases in smoking habits, marketing tactics that promote unhealthy foods, and adjustments to health insurance coverage. Eating habits have been the subject of study in an attempt to pinpoint the nutritional elements that lead to weight gain and obesity. Processed food-rich diets are directly associated with obesity and associated metabolic issues³. Technological advancements have expanded the availability and marketing of ultra-processed foods (UPFs) in recent years, substantially influencing the food supply chain. These highly processed foods are often low in nutrients but high in sugars, salt, protein isolates, high-fructose syrups, maltodextrins, and other additives, including artificial sweeteners, thickeners, colorants, and flavorings. Customers find UPFs very tempting because these ingredients improve flavor, price, and convenience. According to research, UPF consumption has increased recently and now makes up over half of daily calorie intake in nations like the US, UK, and Canada⁴. Because of this over-reliance on UPFs, diets low in fiber and other vital nutrients and rich in calories, saturated fats, sugar, and salt are considered nutritionally poor. There are serious health concerns associated with such nutritional abnormalities.

2. CATEGORIZATION OF OBESITY

As the National Institutes of Health describes, metabolic syndrome encompasses a group of interrelated metabolic disorders, including high blood pressure, elevated cholesterol levels, impaired fasting glucose, and abdominal fat accumulation⁵. Obesity plays a critical role in the onset of this syndrome. The WHO identifies obesity as a medical condition resulting from excessive fat accumulation to a degree endangering health. The increasing prevalence of overweight and obesity worldwide has led to their recognition as a rapidly growing global health crisis. The Body Mass Index (BMI) is a widely used, non-invasive tool for classifying individuals and assessing obesity levels. BMI is calculated by dividing body weight in kilograms by the square of height in meters (kg/m^2). However, it has limitations, such as overestimating obesity in older individuals with higher muscle mass and underestimating it in those with reduced muscle mass. To enhance the accuracy of obesity assessment, additional anthropometric measurements like waist circumference (WC) and waist-to-hip ratio (WHR) are crucial⁶. Epidemiological studies highlight that these measures are strong predictors of non-communicable diseases, including type 2 diabetes and cardiovascular conditions⁷.

Despite its shortcomings, BMI remains the most commonly used indicator for obesity in clinical and research settings due to its ease of measurement during physical exams. Other anthropometric assessments can supplement its accuracy. However, advanced methods such as plicometry,

ultrasonography, and imaging technologies are gaining traction⁸. Diagnostic techniques like dual-energy X-ray absorptiometry (DEXA), bioimpedance analysis, magnetic resonance imaging (MRI), and computed tomography (CT) provide more detailed insights into body composition⁹. Among these, DEXA is the gold standard for its high precision, minimal invasiveness, and affordability. It distinguishes between bone mass, fat, and lean tissue across the body or in certain areas. According to research on the Italian population, the average fat mass percentage is 30% for males and 35% for women¹⁰. Early screening reduces obesity and the related financial and health costs, when combined with prompt intervention and preventative measures. Reducing the incidence of obesity and its effects requires funding medical education, preventative initiatives, and encouraging healthy lifestyles.

3. OBESITY PHENOTYPE

Several factors, including body composition, inflammatory state, genetic susceptibility, adipose tissue distribution and behaviour, and macronutrient metabolism, determine the many phenotypes of obesity. Four main phenotypic types—normal-weight obese individuals (NWOs), metabolically unhealthy, normal-weight obese persons, metabolically healthy obese persons, and metabolically unhealthy obese persons—have been established based on the interaction of these traits and their clinical outcomes¹¹. Functional and metabolic traits are given more weight in this strategy than in traditional classifications that rely on anthropometric information like BMI. The NWO phenotype, has a normal body mass index (BMI) but considerable metabolic abnormalities, low-grade inflammation, hypertension, and increased cardiovascular risk¹². Localized inflammation that frequently spreads to systemic levels is linked to obesity. Adipose tissue growth affects bone density, lean mass, and muscular strength¹³. Two further phenotypes, sarcopenic and osteosarcopenic obesity, have been identified to offer a more complete picture¹⁴. The cohabitation of increasing fat mass with muscle loss, which results in decreased physical strength and functioning, is sarcopenic obesity. Reduced bone mass is another aspect of osteosarcopenic obesity that increases the risk of fractures and skeletal problems. These complicated categories highlight the intricacy of obesity and the necessity of considering variables other than body weight to estimate health risks. Healthcare practitioners can create individualized interventions and therapies by identifying these unique traits.

4. FACTORS ASSOCIATED WITH THE EPIDEMIC OF OBESITY

A complex and pressing public health concern of excess weight is determined by environmental and personal variables, such as socioeconomic position and unhealthy eating patterns, as well as heredity and family education. According to WHO, "diseases of abundance" or illnesses associated with lifestyle choices would be responsible for 30% of deaths worldwide by 2030¹⁵. Early detection, efficient risk factor management, and strong preventative measures are necessary to counteract this trend. Many people believe that obesity is an "acquired" condition that is influenced by behavioral and lifestyle choices, such as the easy availability of junk food and low levels of physical activity¹⁶. Racial and cultural variables can influence weight gain. Studies have suggested that racial segregation in cities may have varying

effects on obesity rates for men and women, with some women exhibiting a positive association¹⁷. Urban environments have a further impact on obesity trends. According to a National Longitudinal Study of Adolescent Health study that included 20,745 teenagers, adolescents who regularly exercised had lower obesity rates when they had access to physical activity facilities in wealthier neighbourhoods¹⁸. Although schools and businesses downplay the significance of physical exercise, it is essential to have weight control programs, especially for teenagers. Food decisions, personal behaviour, and physical inactivity greatly influence daily calorie intake. Food's nutritional value is just as significant as its calorie content. Healthy alternatives, including fruits, vegetables, whole grains, and fresh items, are being consumed less frequently due to advancements in food processing technologies. Ultra-processed meals, heavy in unidentified substances like fats, sugars, and salt, have increased concurrently. These foods contribute to poor health outcomes by raising calorie intake and having a detrimental effect on gut microbial ecosystems.

5. OBESITY'S EFFECTS ON HEALTH: OBESITY AND RELATED DISORDERS

Numerous severe illnesses, including pre-existing ailments like coronary heart disease, neurological disorders, hypertension, stroke, type 2 diabetes, sleep apnea, and osteoarthritis, are associated with obesity. These illnesses have the potential to significantly lower quality of life and increase the risk of mortality in young adults. Among other malignancies, obesity is linked to an increased risk of developing prostate, colon, and breast cancer¹⁹. Preventing these negative consequences requires addressing obesity and its associated health problems with healthy lifestyle choices, such as consistent exercise and a balanced diet. Obesity is a complex illness that requires an all-encompassing approach to therapy. To assist people in reaching and maintaining a healthy weight, medical treatments like drugs or bariatric surgery may be required in addition to lifestyle changes. By managing obesity proactively, one can improve general health and reduce the risk of chronic disease.

6. NEURODEGENERATIVE CONDITIONS

Obesity is significantly associated with neurodegenerative disorders, which are defined by the progressive deterioration of the central or peripheral nervous system. These ailments include dementia in older individuals, Alzheimer's disease (AD), and Parkinson's disease (PD). While controlling obesity may help reduce the incidence of certain conditions, their development is also greatly influenced by other variables, such as genetic predisposition and environmental factors. For certain people, maintaining a healthy weight may not be enough to prevent neurodegenerative diseases completely. Therefore, it is essential to have a holistic approach to health, which includes regular exercise, a healthy diet, mental stimulation, and social interaction. By addressing these, many causes of neurodegenerative illnesses risk can be decreased and general brain health can be improved. In addition, further study is necessary to completely understand the complex relationship between obesity and neurodegenerative diseases, opening the door to future preventative and treatment strategies that are more successful.

7. DIABETES

A high BMI and excess body weight are the most prevalent related comorbidities, accounting for an estimated 90% of type 2 diabetes mellitus cases, according to researchers²⁰. In people with metabolic dysregulation, obesity and diabetes frequently coexist, with low-grade inflammation and insulin resistance being major contributing factors. This interconnected relationship between obesity and diabetes implies the importance of addressing both conditions simultaneously to manage and treat them effectively. Lifestyle modifications, such as regular exercise and a balanced diet, can help improve insulin sensitivity and decrease inflammation in individuals with both obesity and diabetes. Medical interventions, such as medications and bariatric surgery, may also be necessary to manage these comorbidities and reduce the risk of complications effectively. The fact that not all obese people acquire diabetes, however, emphasizes the part that variables other than weight play in the development of the condition. Ignoring weight alone as a risk factor for diabetes ignores the impact of lifestyle decisions, genetic predisposition, and general metabolic health. Therefore, healthcare providers must use a comprehensive approach while assessing a patient's risk. This approach should include evaluating weight and factors such as diet, exercise habits, family history, and blood sugar levels. By considering these variables, healthcare providers can more accurately assess an individual's risk for developing diabetes and tailor interventions accordingly. This personalized approach is crucial in effectively managing diabetes and its associated comorbidities in obese individuals²¹. Medical professionals may create more individualized preventative and treatment plans by combining weight with factors including genetic background, lifestyle choices, and metabolic health. By identifying and managing the underlying causes of diabetes, this customized approach improves patient outcomes and the efficacy of therapies. However, it is important to note that even with personalized interventions, there may still be cases where individuals do not respond as expected or experience complications. Understanding the complex process of diabetes development will help design more targeted and effective interventions, eventually improving the health of those at risk.

8. APNEA

Excess weight significantly affects the respiratory system and often causes or aggravates conditions like asthma and obstructive sleep apnea²². Children who are overweight or obese are more likely to have certain respiratory problems. These children may experience shortness of breath, wheezing, and difficulty breathing, especially during physical activity. Excess weight can add extra pressure on the lungs and diaphragm, making it harder for the respiratory system to function properly²³. Parents and healthcare providers must address weight management to improve respiratory health in overweight children. Weight gain is not the only cause that contributes to the development of diabetes, but it is a contributing factor to respiratory issues such as sleep apnea²⁴. Other important factors include lifestyle choices, genetics, and other medical issues. Parents and healthcare providers can help reduce the risk of developing respiratory issues in overweight children by addressing weight management and promoting a healthy lifestyle. Regular physical activity and a balanced diet can improve respiratory health and well-being. A holistic approach to health is

essential to prevent complications and promote long-term wellness in children. To properly treat diabetes and other weight-related health issues, medical professionals must take a comprehensive strategy. This entails considering all relevant variables and creating individualized treatment programs focusing on the disease's root causes. Promoting healthy lifestyle choices, such as consistent exercise and a well-balanced diet, is crucial for controlling and preventing diabetes in those who are at risk because of their weight. A holistic approach to diabetes prevention and weight control can improve health outcomes for at-risk people.

9. HEART-RELATED CONDITIONS

An increased risk of cardiovascular diseases (CVDs) is associated with being overweight. The obesity phenotype of those who are considered normal-weight obese may have an even poorer prognosis. The initiation and progression of cardiovascular diseases, including Type 2 diabetes, metabolic syndrome, elevated blood sugar, low-grade systemic inflammation, and dyslipidemia, are intimately linked to physiological disturbances caused by excess body weight. Excess body fat has been linked to 16% of heart disease cases in women and 24% in men, according to research. Although being overweight is a major risk factor for CVDs, it is not the only cause²⁶. Lifestyle decisions, general health, and genetic predispositions all have a significant impact on cardiovascular outcomes. These variables have intricate interactions that affect how the illness develops. For example, those who are genetically inclined to have high cholesterol are more likely to develop dyslipidemia, which can raise the risk of heart disease²⁷. Lifestyle choices such as nutrition, exercise, and smoking have a big impact on the onset and severity of cardiovascular diseases. Effective prevention and management of CVDs requires a comprehensive strategy that tackles many risk factors and encourages healthy lifestyle choices in light of these interrelated variables.

10. THE DEFINITION AND CHARACTERISTICS OF ULTRA-PROCESSED FOOD

As the fifth biggest cause of death globally, obesity has grown to be a serious health concern, and new research has connected the pandemic to the widespread use of ultra-processed foods (UPFs). UPFs are typically high in added sugars, unhealthy fats, and artificial ingredients, making them a major contributor to weight gain and other health issues. Studies have shown that individuals who consume a diet high in UPFs are more likely to be overweight or obese compared to those who prioritize whole, minimally processed foods. In addition, the convenience and affordability of UPFs have made them a staple in many people's diets, further exacerbating the obesity epidemic. To improve flavour, shelf life, and convenience, these foods are industrially created through a lengthy process that includes adding sugars, fats, salts, and chemical additives to whole or slightly processed meals. These additives not only contribute to weight gain and other health issues, but they also lack essential nutrients that whole foods provide. As a result, individuals who rely heavily on UPFs may suffer from deficiencies in vitamins, minerals, and fiber. Individuals must prioritize whole, minimally processed foods to maintain a healthy diet and prevent the negative effects of consuming UPFs. Diets high in UPFs, which frequently take the place of whole foods like fruits, vegetables, and fresh grains, are to blame for the rising incidence of obesity and associated diseases, including

dyslipidemia, hypertension, type 2 diabetes, and metabolic syndrome²⁸. While it is true that UPFs may lack some essential nutrients, it is possible to consume a balanced diet by incorporating a variety of whole foods alongside processed options. Moderation and portion control are key factors preventing negative health effects associated with consuming UPFs. Unprocessed or minimally processed foods (like fresh fruits and vegetables), processed culinary ingredients (like butter, oils, salt, and sugar), processed foods (which combine ingredients from the first two groups), and ultra-processed foods (which contain multiple modified ingredients and additives for improved taste and durability) are the four categories processed foods.

11. ULTRA-PROCESSED FOOD CONSUMPTION AND OBESITY ARE RELATED

Due to modern lifestyle considerations, including hectic work schedules, time constraints, and the desire for quick meals, the demand for ultra-processed foods (UPFs) has increased over time. Due to these circumstances, there is a greater dependence on convenient foods to eat at work. This pattern adds to thoughtless eating, impairs satiety and appetite regulation, damages brain and digestive processes, and eventually results in overeating²⁹. Increased blood pressure and metabolic and cardiovascular risks are among the repercussions of this activity. Because UPFs frequently include large amounts of salt, they may raise the risk of hypertension. Furthermore, these meals' simple sugar content has a detrimental effect on fructose metabolism, which first increases insulin resistance in the liver and then spreads throughout the body, exacerbating low-grade inflammation³⁰. To control blood sugar, pancreatic β cells respond by secreting more insulin, which can harm the cells and impair their ability to operate. Because UPFs include a lot of saturated and trans fats, they also change lipid profiles when consumed in excess. They make it harder for VLDL-C to be broken down, which raises blood triglycerides and lowers HDL cholesterol. This disturbance in lipid metabolism exacerbates atherosclerosis and other cardiovascular diseases. The processed sugars in UPFs can potentially aggravate inflammation and insulin resistance by increasing oxidative stress and cellular damage. Ingesting UPFs interferes with metabolic functions and increases the risk of chronic illnesses associated with unhealthy eating and lifestyle choices.

12. EXTREMELY PROCESSED FOOD AND NUTRITIONAL HABITS

The NOVA classification system categorizes foods based on their level of processing rather than nutrient content into four groups³¹. Group 1 includes unprocessed or minimally processed foods, such as fresh fruits, vegetables, milk, eggs, and nuts. These retain their natural structure and undergo little or no processing, making them foundational to a healthy diet. Group 2 comprises processed culinary ingredients, such as sugar, salt, and oils, derived from natural foods and used to prepare meals. Group 3 includes processed foods made by adding ingredients like salt, sugar, or oils to Group 1 foods. Common examples are canned vegetables, cheese, and bread, often created for convenience or enhanced shelf life. Group 4, the most concerning, encompasses ultra-processed foods industrially manufactured using extracted or synthesized substances, like emulsifiers and artificial flavors. These include soft drinks, packaged snacks, and instant meals,

designed to be hyper-palatable and convenient but often nutrient-poor and linked to health risks. The NOVA classification promotes awareness of food processing's

impact on health, encouraging the consumption of minimally processed foods while limiting ultra-processed products to improve dietary quality and reduce chronic disease risks.

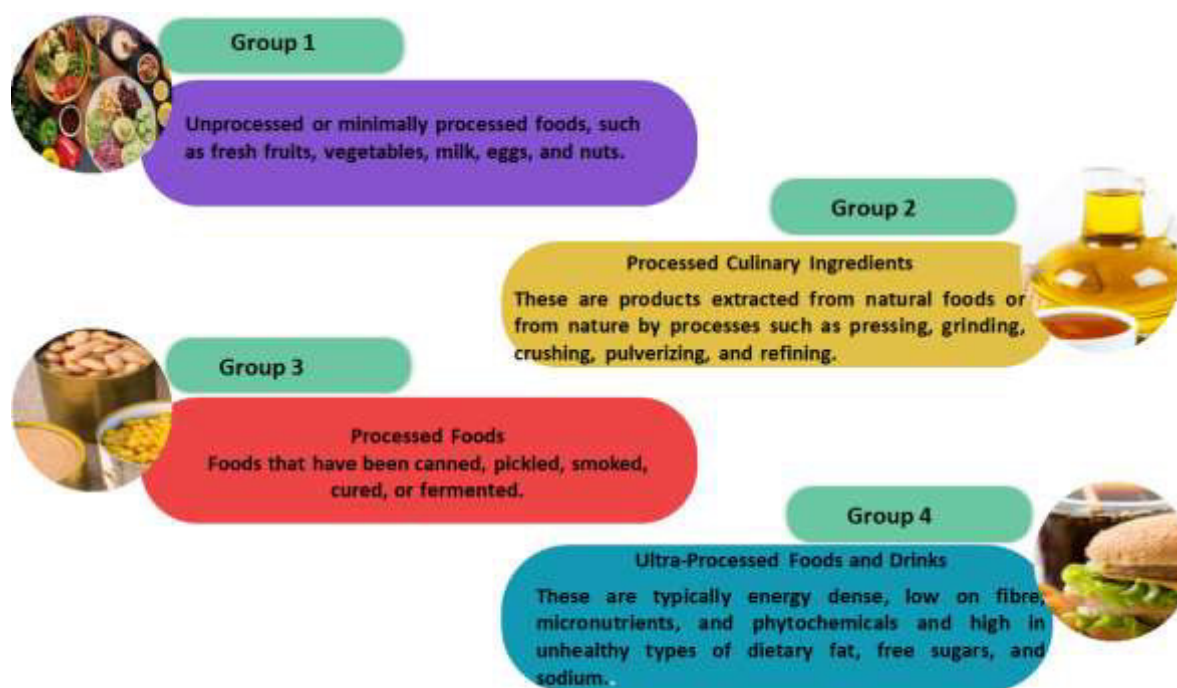


Fig 1: Ultra-processed foods and Drinks

In addition to differences in ingredients and manufacturing processes, UPF foods also have different intended uses. According to earlier research, UPFs aim to produce artificial, convenient, easily consumable, and aesthetically pleasing foods using low-cost components. The manufacturing of UPFs counter the Mediterranean diet's recommendations, which call for consuming fewer packaged, processed, and ultra-processed foods. UPFs are nutritionally imbalanced, poor in fiber, vitamins, and minerals, and mostly composed of added sweets, salt, and unhealthy fats. Frequent use of these meals leads to a general nutritional imbalance, which contributes to the development of health disorders and metabolic problems in addition to excessive consumption. Essential nutrients are lost due to their manufacturing procedures, which can potentially produce hazardous materials, such as when polyunsaturated fats are hydrogenated³². The inclusion of substances such as sugars, oils, protein isolates, and additives is not only involved in changing the food matrix, but these procedures also release hazardous materials from synthetic packaging. Colorants, emulsifiers, and artificial sweeteners like aspartame, saccharin, and acesulfame K are among the many additives included in UPF foods. Because they improve flavour and raise the risk of addiction, these chemicals are purposefully employed to encourage use. Even though they are marketed as "foods," they are significantly less nutrient-dense than fresh or lightly processed meals. Characterizing them as non-nutritive would be more precise since beneficial chemicals are degraded during processing. When whole, unprocessed foods are replaced with a diet high in these non-nutritive items, health consequences may result. There are essentially two types of diets: one that consists of minimally processed foods made at home or in local eateries and another that consists of ultra-processed foods that are mass-produced and easily accessible, such as fast food and ready meals. Supermarket aisles are filled with a wide range of UPF meals,

both savoury and sweet, as well as beverages with eye-catching marketing promises that frequently compromise the quality of the product. It is indisputable that marketing methods are efficient in pushing combinations of various items, such as chips, hamburgers, sugary drinks, snacks, and fruit juices that don't include real fruit. Consuming these goods primarily or exclusively poses serious long-term health concerns. According to a controlled study, those who consumed 80% of their calories from these unhealthful meals suffered from severe malnutrition, elevated body fat, and excessive caloric consumption³³. The ultra-processed diet paradigm has also been linked to nutritional inadequacies, according to other studies³⁴.

13. IMPLICATIONS FOR PUBLIC HEALTH

A multimodal strategy is needed to address the global obesity issue, with public health policies being a key factor in influencing people's dietary decisions. Reducing ultra-processed meals, heavy in unhealthy chemicals, carbohydrates, and fats, is a major priority. The availability and accessibility of certain items can be restricted by government legislation, such as taxing sugary beverages and snacks, banning child-targeted advertising, and controlling restaurant portion sizes. Furthermore, defining precise dietary recommendations might enable customers to make better choices. Governments and health experts can collaborate to develop policies encouraging whole, less processed foods and forbidding ultra-processed meals. Campaigns that highlight the negative health impacts of excessive amounts of sugar, salt, and trans fats—especially about diabetes, heart disease, and obesity—are also crucial for informing the public about the risks of eating highly processed foods. Clear and informative labels labeling can help people identify ultra-processed foods and make healthier choices. Promoting the consumption of nutritious

foods including lean meats, whole grains, fruits, and vegetables, is essential. Dietary preferences can be shifted away from highly processed meals by making these items more accessible, inexpensive, and enticing. Since schools greatly impact kids' eating patterns, school-based interventions are crucial. Healthy eating may be promoted from young age by implementing nutrition education programs and ensuring school meals meet health requirements. A comprehensive approach that includes education, community involvement, regulatory changes, and cooperation with the food industry is needed to combat obesity and lower consumption of ultra-processed foods. Societies can lower the frequency of illnesses linked to obesity and establish better eating conditions by implementing these strategies together.

14. OBSTACLES AND PROSPECTS

Addressing the intricate problems of obesity and ultra-processed food consumption offers formidable obstacles and chances for innovative research and policy formation. The uneven distribution of resources and access to nutrient-dense foods is one of the primary challenges. Low-income populations may rely more on cheap, highly processed meals since less fresh, healthful choices are frequently available. To eliminate these gaps, a diversified strategy that considers social, economic, and environmental aspects is needed. Furthermore, a significant obstacle to developing better food environments is the influence of the food business. Dietary behaviour change is challenging because it requires ongoing encouragement, assistance, and resource availability. Many people struggle to adopt healthy eating habits because of cultural preferences, a lack of cooking abilities, and ingrained behaviours. The environmental effect of ultra-processed meals is usually higher than that of whole, slightly processed foods. Therefore, balancing ecological concerns and health outcomes is necessary to combat obesity while advancing environmental sustainability. Future studies should concentrate on methods that promote sustainable diets that are good for the environment and human health. Individual biological predispositions and genetic variables can also influence a person's vulnerability to metabolic diseases and obesity. Policymakers, academics, and stakeholders must collaborate to translate findings into practical policies. The emergence of digital health technology presents fresh chances to fight obesity and promote better dietary choices. Online platforms, wearable technology, and mobile applications can monitor behaviour, give tailored feedback, and provide instructional materials to help people manage their weight and make healthier food choices. Research should keep addressing these issues in the upcoming years, looking at creative ways to promote better eating conditions and lessen the effects of illnesses linked to obesity. Finding comprehensive solutions that improve public health outcomes worldwide will need cooperation across disciplines, sectors, and stakeholders.

18. REFERENCES

1. Ahmed N, Dash B, Ghosh S, Kumar A. Cancer and Food-Related Risks: A Review. *International Journal of Trends in OncoScience*. 2024 Apr 5:1-1.
2. Siegel AD. NAFTA largely responsible for the obesity epidemic in Mexico. *Wash. UJL & Pol'y*. 2016;50:195.

15. CONCLUSION

In conclusion, many studies demonstrate the detrimental impacts of ultra-processed foods on public health, making the link between their consumption and obesity evident. The worldwide obesity issue has been largely caused by the pervasiveness of ultra-processed foods in modern diets, which are preferred for their flavor, cost, and convenience. These meals cause metabolic imbalances and overconsumption of calories because they contain harmful chemicals, carbohydrates, and fats that disrupt the body's normal hunger and satiety signals. Digital health technologies can help promote healthier food environments and assist people in making more educated dietary choices. Still, thorough assessment methods are required to gauge the success of policy measures. To develop comprehensive solutions that improve public health and lessen the worldwide burden of obesity-related illnesses, addressing these challenges calls for constant cooperation and creativity. By leveraging data analytics and artificial intelligence, policymakers may better understand the many elements influencing dietary choices and create interventions suited to certain groups' requirements. Implementing evidence-based methods to lower obesity rates can be made easier by partnerships between healthcare providers and industrial participants. Ultimately, attaining long-lasting gains in public health requires a comprehensive strategy incorporating community engagement, technical advancement, and policy reform. Trends in food consumption may be found using data analytics and artificial intelligence (AI), allowing for more focused efforts to promote better eating practices. Cooperation with business partners can fuel innovations like improved nutrition labeling and healthier food alternatives. Treatments are supported and tailored to the individual by including healthcare professionals, encouraging long-term behavioural change. Combined, these tactics provide a thorough and successful strategy for combating obesity and improving general public health outcomes. Addressing the obesity epidemic and enhancing public health outcomes may be accomplished with cooperation and emphasizing evidence-based methods.

16. AUTHORS CONTRIBUTION STATEMENT

Dr. Sathiya Narayana Murthy contributed to the study's conceptualization, study design, and manuscript drafting. Dr. Uthamalingam Murali provided supervision, coordinated the research process, and reviewed the manuscript critically for intellectual content. Dr. Shilpa Bhargava was involved in data collection, statistical analysis, and manuscript writing. All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

17. CONFLICT OF INTEREST

Conflict of interest declared none.

- processed food consumption among the paediatric population: an overview and call to action from the European Childhood Obesity Group. *Annals of Nutrition and Metabolism*. 2020 Apr 28;76(2):109-13.
5. Grundy SM, Cleeman II, Daniels SR, Donato KA, Eckel RH, Franklin BA, Gordon DJ, Krauss RM, Savage PJ, Smith Jr SC, Spertus JA. Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute scientific statement. *Circulation*. 2005 Oct 25;112(17):2735-52.
6. Bojanic D, Liubojevic M, Krivokapic D, Gontarev S. Waist circumference, waist-to-hip ratio, and waist-to-height ratio reference percentiles for abdominal obesity among Macedonian adolescents. *Nutricion hospitalaria*. 2020.
7. Yun JS, Ko SH. Current trends in epidemiology of cardiovascular disease and cardiovascular risk management in type 2 diabetes. *Metabolism*. 2021 Oct 1;123:154838.
8. Liotto N, Radaelli T, Orsi A, Taricco E, Roggero P, Gianni ML, Consonni D, Mosca F, Cetin I. Relationship between in utero sonographic evaluation and subcutaneous plicometry after birth in infants with intrauterine growth restriction: an exploratory study. *Italian Journal of Pediatrics*. 2010 Dec;36:1-8.
9. Kullberg J, Brandberg J, Angelhed JE, Frimmel H, Bergelin E, Strid L, Ahlstrom H, Johansson L, Lonn L. Whole-body adipose tissue analysis: comparison of MRI, CT and dual energy X-ray absorptiometry. *The British journal of radiology*. 2009 Feb 1;82(974):123-30.
10. Coin A, Sergi G, Minicuci N, Giannini S, Barbiero E, Manzato E, Pedrazzoni M, Minisola S, Rossini M, Del Puente A, Zamboni M. Fat-free mass and fat mass reference values by dual-energy X-ray absorptiometry (DEXA) in a 20–80 year-old Italian population. *Clinical Nutrition*. 2008 Feb 1;27(1):87-94.
11. Mohammadian Khonsari N, Khashayar P, Shahrestanaki E, Kelishadi R, Mohammadpoor Nami S, Heidari-Beni M, Esmaeili Abdar Z, Tabatabaei-Malazy O, Qorbani M. Normal weight obesity and cardiometabolic risk factors: A systematic review and meta-analysis. *Frontiers in endocrinology*. 2022 Mar 24;13:857930.
12. Sumathy T, Maheshkumar V P and Jaikumar S , Paradoxical Association Between Dietary Lifestyle and Cardiovascular Risk: Cross-
13. Sectional Analysis of Patient Responses from A Tertiary Care Hospital. *Int. J. Life Sci. Pharma Res.* 2022.12(5), P205-214
14. González-Rocha A, Mendez-Sanchez L, Ortíz-Rodríguez MA, Denova-Gutiérrez E. Effect of exercise on muscle mass, fat mass, bone mass, muscular strength and physical performance in community dwelling older adults: systematic review and meta-analysis. *Aging and Disease*. 2022 Oct 10;13(5):1421.
15. Lee K. Association of osteosarcopenic obesity and its components: osteoporosis, sarcopenia and obesity with insulin resistance. *Journal of bone and mineral metabolism*. 2020 Sep;38:695-701.
16. Andre FE, Booy R, Bock HL, Clemens I, Datta SK, John TJ, Lee BW, Lolekha S, Peltola H, Ruff TA, Santosham M. Vaccination greatly reduces disease, disability, death and inequity worldwide. *Bulletin of the World health organization*. 2008;86:140-6.
17. K. Mageswari Mohanram, and Helen Shaji J. C , Effect of An Education Intervention on Knowledge of Junk Foods, Healthy Food Habits Among The School-Going Children At Selected Schools In Chennai, India – A Pre-Experimental Multicentric Trial. *Int. J. Life Sci. Pharma Res.* 2023.13(2), L41-L50
18. Bower KM, Thorpe RJ, Yenokyan G, McGinty EE, Dubay L, Gaskin DJ. Racial residential segregation and disparities in obesity among women. *Journal of Urban Health*. 2015 Oct;92:843-52.
19. Resnick MD, Bearman PS, Blum RW, Bauman KE, Harris KM, Jones I, Tabor I, Beuhring T, Sieving RE, Shew M, Ireland M. Protecting adolescents from harm: findings from the National Longitudinal Study on Adolescent Health. *Jama*. 1997 Sep 10;278(10):823-32.
20. Ghosh S, Balasubramanian K, Milton JA, Angadi VB, Kuriri H, Ghate U, Ketkar R. Obesity and Cancer: Oncology-Obesity. *International Journal of Trends in OncoScience*. 2023 Oct 3:38-51.
21. James WP, Jackson-Leach R, Mhurchu CN, Kalamara E, Shayeghi M, Rigby NJ, Nishida C, Rodgers A. Overweight and obesity (high body mass index). Comparative quantification of health risks: global and regional burden of disease attributable to selected major risk factors. 2004;1:497-596.
22. Natto HA, Sahoo D, Muneera N. Benefits of Personalized Diet, Nutrition, And Exercise Programs for Cancer Survivors. *International Journal of Trends in OncoScience*. 2024 Apr 5:12-22.
23. Teodorescu M, Barnet JH, Hagen EW, Palta M, Young TB, Peppard PE. Association between asthma and risk of developing obstructive sleep apnea. *Jama*. 2015 Jan 13;313(2):156-64.
24. Goligher EC, Jonkman AH, Dianti J, Vaporidi K, Beitler JR, Patel BK, Yoshida T, Jaber S, Dres M, Mauri T, Bellani G. Clinical strategies for implementing lung and diaphragm-protective ventilation: avoiding insufficient and excessive effort. *Intensive care medicine*. 2020 Dec;46(12):2314-26.
25. Chirinos JA, Gurubhagavatula I, Teff K, Rader DJ, Wadden TA, Townsend R, Foster GD, Maislin G, Saif H, Broderick P, Chittams J. CPAP, weight loss, or both for obstructive sleep apnea. *New England Journal of Medicine*. 2014 Jun 12;370(24):2265-75.
26. Myint PK, Kwok CS, Luben RN, Wareham NJ, Khaw KT. Body fat percentage, body mass index and waist-to-hip ratio as predictors of mortality and cardiovascular disease. *Heart*. 2014 Oct 15;100(20):1613-9.
27. Elshourbagy NA, Meyers HV, Abdel-Meguid SS. Cholesterol: the good, the bad, and the ugly-therapeutic targets for the treatment of dyslipidemia. *Medical Principles and Practice*. 2014 Dec 11;23(2):99-111.
28. Sousa AF, Campos JD, Oliveira DK, Pereira JG, Santo MJ, Souza VD, Simões-Alves AC, Costa-Silva JH. Degree of Food Processing (NOVA Classification) and Blood Pressure in Women with Overweight and Obesity. *Obesities*. 2024 Sep 4;4(3):353-64.
29. Ahima RS, Antwi DA. Brain regulation of appetite and satiety. *Endocrinology and metabolism clinics of North America*. 2008 Dec 1;37(4):811-23.
30. Castro MC, Massa ML, Arbeláez LG, Schinella G, Gagliardino II, Francini F. Fructose-induced inflammation, insulin resistance and oxidative stress: A

- liver pathological triad effectively disrupted by lipoic acid. *Life sciences*. 2015 Sep 15;137:1-6.
31. Petrus, R.R., do Amaral Sobral, P.J., Tadini, C.C. and Gonçalves, C.B., 2021. The NOVA classification system: A critical perspective in food science. *Trends in Food Science & Technology*, 116, pp.603-608.
32. Han SN, Leka LS, Lichtenstein AH, Ausman LM, Schaefer EJ, Meydani SN. Effect of hydrogenated and saturated, relative to polyunsaturated, fat on immune and inflammatory responses of adults with moderate hypercholesterolemia. *Journal of lipid research*. 2002 Mar 1;43(3):445-52.
33. Wells JC, Marphatia AA, Amable G, Siervo M, Friis H, Miranda JJ, Haisma HH, Raubenheimer D. The future of human malnutrition: rebalancing agency for better nutritional health. *Globalization and health*. 2021 Dec;17:1-25.
34. Mediratta S, Ghosh S, Mathur P. Intake of ultra-processed food, dietary diversity and the risk of nutritional inadequacy among adults in India. *Public Health Nutrition*. 2023 Dec;26(12):2849-58.