NEWER MODALITIES IN PREVENTION AND MANAGEMENT OF OBESITY

Abstract

The issue of obesity has grown to epidemic proportions nowadays. Over 50 genes linked to obesity have been found in genome-wide studies. Obesity significantly raises mortality and morbidity risks at any age. Current management involves lifestyle changes, medications and surgical interventions. Additionally, novel strategies such as advanced drug delivery, vaccines, gut microbiome modulation, and gene therapy are being explored to combat obesity. The potential of Artificial Intelligence to transform obesity management is also being recognized.

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I. INTRODUCTION

A body mass index (BMI) exceeding 25 indicates being overweight, while a BMI above 30 signifies obesity.The problem of obesity has reached alarming levels in recent times, resulting in over 4 million annual deaths in 2017 due to overweight, obesity, or related complications as reported by the global burden of disease. Research indicates that the occurrence of overweight or obesity in children and teenagers aged 5–19 has surged from 4% to 18% worldwide between 1875 and 2016. The World Health Organization (WHO) predicts that by 2025, one in five adults will be obese.

II. KEY ETIOLOGIC FACTORS OF OBESITY

The primary factor contributing to obesity and overweight is the disparity between the calories ingested and the calories burned. This disparity is linked to an increased intake of foods rich in lipids and sugars, coupled with physical inactivity attributable to today's sedentary lifestyle. These changes are mainly influenced by environmental and societal shifts, resulting from development and insufficient supportive strategies across different domains including healthcare, farming, transit, ecology, food processing and distribution and education. In some cases, underlying medical conditions like hypothyroidism and Cushing's syndrome may also contribute to overweight and obesity. Additionally, certain medications, such as steroids, anti-epileptics, anti-diabetics, and psychiatric medications (including some antidepressants and drugs for schizophrenia), can lead to the development of obesity.

Obesity can be caused by rare genetic conditions, like Prader-Willi syndrome. In some families, obesity is linked to changes in a specific gene called MC4R, which leads to overeating due to increased hunger. About 5% of obese individuals from various ethnic backgrounds have alterations in the MC4R gene. Additionally, there are at least nine other genes associated with single-gene obesity. However, in the majority of obese people, there is no single identifiable genetic cause. Since 2006, over 50 genes have been discovered through genome-wide association studies to have a connection with obesity, though their effects are generally small. One common genetic change related to obesity is found in the FTO gene, present in around 75% of Europeans and North Americans, leading to a 20%–30% increased risk of obesity(5)

III. COMPLICATIONS OF OBESITY

Obesity significantly heightens the risk of various health issues, encompassing conditions like type 2 diabetes mellitus, coronary artery disease , cardiac failure, raised blood pressure, cerebro vacular accidents, lipid abnormalities, gall bladder disease, osteoarthritis, sleep apnea and certain malignancy like colon , ovarian and breast cancer. Additionally, being overweight substantially amplifies the likelihood of mortality across all age ranges. To illustrate, in women who don't smoke, possessing a BMI $\geq$ 32.0 kg/m2 leads to a striking 4.1 times greater risk of death due to cardiovascular issues and a 2.1 times higher risk of cancer-related fatality compared to those with a BMI < 19 kg/m2 (6).

IV. INVESTIGATIONS IN OBESITY

Investigating obesity requires a comprehensive approach, given its complex and multifactorial nature. A thorough history, including dietary, family, and drug background, should be gathered, followed by a physical examination focusing on anthropometric measurements like height, weight, and waist-to-hip ratio. Assessing potential complications of obesity, such as varicose veins, peripheral edema, and other systemic issues, is also crucial for its management. Laboratory tests are crucial to rule out any underlying causes of obesity and to assess its related complications. A foundational set of tests, including a complete blood count, liver and kidney function tests, as well as bone and mineral studies, hold significant value. It's also recommended to undergo fasting blood sugar, lipid profile, and thyroid function tests to detect any potential presence of diabetes, dyslipidemia, and hypothyroidism. Due to the prevalent occurrence of hypertension and cardiovascular ailments associated with obesity, it is recommended to conduct an ECG as part of the assessment. Additional examinations will be determined based on the level of suspicion for potential underlying problems such as Cushing's disease or concurrent health issues like polycystic ovary syndrome .

Typically, assessing plasma leptin levels isn't a standard practice, but it could provide useful insights in instances where there are concerns about leptin deficiency, such as in cases of severe obesity, increased appetite, hyperphagia, hypogonadotropic hypogonadism, or significant lipodystrophy. Young individuals manifesting traits consistent with monogenic obesity variants should be directed to an expert center for a thorough and in-depth evaluation (7).Since obesity is a multifaceted issue, effective investigation requires collaboration between researchers, healthcare professionals, policymakers, and community members.

V. PREVENTION AND MANAGEMENT OF OBESITY

Numerous factors contributing to overweight and obesity can be proactively addressed and reversed with conscious effort and dedication. However, no country has successfully halted the rise of this epidemic. Currently, managing obesity and its consequences relies on lifestyle changes, medication as an additional option, and interventions like intragastric balloons and endosleeve procedures. It's crucial to pursue gradual and sustainable weight loss, as rapid and extreme approaches can be detrimental to health. Reducing the likelihood of developing overweight and obesity involves diminishing the intake of fats and sugars, boosting the incorporation of fruits, vegetables, legumes, whole grains, and nuts into diet and being engaging in regular physical activity for least 1 hour per day for children and two and half-hour per week for adults . Creating supportive environments and communities is vital in guiding people to opt for healthier food choices and regular physical activity.Research has indicated that exclusively breastfeeding infants until 6 months of age diminishes the likelihood of them developing overweight or obesity(1).

Medical weight management continues to be a choice for addressing over weight, and recent breakthroughs have revolutionized our approach to treating obesity, with promising developments on the horizon. Metreleptin and Setmelanotide are presently utilized for managing uncommon obesity syndromes, whereas five additional medications (orlistat, phentermine/topiramate, naltrexone/bupropion, liraglutide, semaglutide) have been approved for tackling non-syndromic obesity.Newer drug Tirzepatide is nearing approval, and other

drugs with noval mechanisms based on incretins are under investigation in various stages of clinical trials (8).

Apart from conventional medications, researchers are exploring alternative approaches to combat obesity, such as newer drug delivery methods, immunisation, alteration of intestinal microbiota , and gene therapy. One promising avenue involves nanotechnology-based approaches , specifically targeting white adipose tissues (WATs) and their vasculature to reverse obesity. These approaches include inhibiting angiogenesis in WATs, converting them to brown adipose tissues and using procedure like photothermal lipolysis . Targeted-nanosystems demonstrate higher tolerability, reduced side effects, and increased effectiveness compared to conventional therapies. A variety of nano- carriers, including liposomes, polymeric nanoparticles, and gold nanoparticles have shown reproducible effects, supporting the potential of targeted nanotherapy as a viable strategy in the battle against obesity and its related health complications (9).

Noval approaches for primordial prevention of juvenile obesity includes maintaining a favorable maternal weight prior to conception, exclusive breastfeeding for initial six months of life, observation , evaluation and early intervention in case of abnormal weight gain during first couple of years of life , lowering the consumption of added sweetners and fats among children,Improving the nutritional value and availability of children's diet , and minimizing exposure to environmental obesogens.(10).

VI. ROLE OF ARTIFICIAL INTELLIGENCE IN OBESITY MANAGEMENT

Artificial intelligence can revolutionize obesity management by providing personalized diet and exercise plans, predicting risk factors, and analyzing body composition from images or scans. AI's ability to analyze vast health data can offer valuable insights to healthcare providers for better decision-making. AI-powered applications can provide ongoing coaching and support, while chatbots equipped with NLP (Natural Language Processing) can engage with patients, improving patient compliance . Additionally, AI-driven robotic systems enhance the precision and safety of bariatric surgery, and VR (Virtual Reality) and AR (Augmented Reality) technology aid behavior change by creating immersive health experiences. Overall, AI holds great promise in tackling obesity and promoting healthier lifestyles.

Despiteitspromise,itisessentialtoapproachAIintegrationinobesitymanagementwithcautionandensurethatethicalconsiderations,dataprivacy,andregulatoryguidelinesarerespected.Moreover,AIshouldcomplementratherthanreplacehumanhealthcareproviders,aspersonalizedpatientcareandempathyremaincrucialaspectsofobesitymanagement.

VII. CONCLUSION

Obesity has become a global issue, reaching epidemic proportions in recent years, but there are numerous actions we can take to address it. Progressing in the realm of obesity prevention entails reshaping the informational and political domains to prioritize public health and concentrating efforts on equitable frameworks for vulnerable populations . Artificial intelligence has the potential to revolutionize obesity management by providing innovative tools and solutions for prevention, diagnosis, treatment, and ongoing support.

Being overweight is not merely a numerical value on the scale; it reflects the overall state of our health and well-being. By implementing proactive measures and making informed choices, we can combat this problem and improve our quality of life.

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