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Review

Health impact of obesity

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Abstract

Obesity is considered a global health concern. According to the World Health Organization, the available data indicates that globally almost a third of the population is diagnosed with obesity and might be at risk of developing more than ten types of oncological conditions later in life. Weight gain is a modifiable health risk factor resulting from complex interactions between behavioral and environmental factors that might increase the burden of obesity-related noncommunicable diseases, such as cardiometabolic diseases and cancer. The urbanization process, better food and beverages access, availability, affordability, the effect of eating habits, and the enhanced neural cue reactivity to taste and visual food stimuli might highlight delayed satiety and some types of eating disorders. Healthy behaviors are usually determinants of a negative energy balance, improved health outcomes, a disease-free life, better weight management and better quality of life.

Keywords: obesity, noncommunicable diseases, diet, physical activity, behavior, disease, risk factors, well-being, weight gain.

Introduction

Obesity is considered a complex multifactorial disorder. Three billion people worldwide are overweight or obese [1], and globally, almost 78% of individuals are living in poor health. Ensuring access to health care and facilitating well-being at the population level are nowadays global health concerns. Unfortunately, less than half of the World's population has access to healthcare services [2]. Behavioral and environmental factors have a long-term impact on metabolic homeostasis. Excessive adiposity is attributable to dysfunctional metabolic rate, adipocyte division and hypertrophy. Adipose tissue dysfunction occurs when glucose homeostasis, lipid metabolism and inflammation are impaired. To summarise, individuals with obesity have abnormal production of lipid-derived hormones known as adipokines. Individuals with a high BMI have increased leptin and resistance levels and decreased adiponectin levels. Thus, one of those molecules, adiponectin, starts increasing after weight-loss interventions, protecting against atherosclerosis and diabetes.

Material and methods

Behavioral risk factors account for more than half of all deaths. Behavioral risk factors are a threat to population health, as well as poor nutrition and lack of physical activity [3]. This article is based on self-reported data available in current databases. At the population level, the main determinants of the obesity pandemic remain controversial due to the variable data and methodology used. We searched for data referring to life obesity, noncommunicable diseases, life expectancy, quality of life, leisure-time physical activity, diets and self-measurements.

Aims

Over the last decades, Europe's life expectancy increased by about three years. The issue has grown to obesity epidemic proportions, with over four million people being affected yearly by weight gain due to obesity-related medical conditions. Data also shows that a

person living in this region lives about 65 years in good health [4].

This study adds growing evidence that neural food cue reactivity, the individual different brain responses, disrupting molecular mechanisms, might gradually increase the burden of obesity-related health conditions. Weight problems and obesity are increasing at a rapid rate in most countries, with estimates of more than half of Europe's population being overweight or obese. The Body Mass Index is used to define overweight (BMI=25–29.9 kg/m^2) and obesity (BMI>30 kg/m^2).

Thus, metabolic health can also be assessed by monitoring the percentage and distribution of adipose tissue in the body. Even at the same BMI, individuals have a different percentage of adipose tissue (Women ≥32%, Men ≥25%). Weight loss reduces the size of the adipocytes, but the number remains almost the same. This yo-yo effect is visible mostly in patients with a higher body fat percentage in childhood.

Hyperleptinemia and hyperghrelinemia play an important role in adipose tissue dysfunction and insulin sensitivity [5]. Obesity-induced by an excess of calories causes adipocyte hypertrophy, affects adipokine secretion, decreases lipid and glucosidic metabolism, and increases immune infiltration and inflammation. It is well known that the number of adipocytes is usually established at a young age (at about the age of 18 years).

Suppose the old theories claimed that the number of lipid cells in the body remains almost the same during the life span, and only the size of adipocytes adapts to the metabolic rate [2]. In that case, new theories of adipocyte turnover claim that the adipose tissue expansion and division are independent of the previous factors affecting the basal metabolic rate. Living in an obesogenic environment involves a high amount of energy-disrupting chemicals that increase fasting plasma glucose, blood pressure, cholesterolemia, triglyceridemia, as well as the secretion of adipokines. Disruption of homeostasis at the molecular level is involved in complex metabolic changes in the blood, adipose tissue, skeletal muscle, and β-pancreatic islets, as well as in the liver [5]. Hepatic adiposity is considered to be suggestive for adipose tissue dysfunction and susceptibility to metabolic conditions [3].

Leptin, resistin, and adiponectin are considered adiposity hormones, secretory energy-storing products of the white adipose tissue that adapt the energy balance, the insulin sensitivity and the daily caloric intake. Leptin is secreted by adipocytes, adiponectin and resistin are synthesized in the white adipose tissue, while ghrelin is specific for the gastric mucosa. Leptin acts at the hypothalamic level and involves mitochondrial dysfunction, reshaping the lipostructure. Plenty of molecular genetics studies have shown that leptin secretion increases proportionally to the previous body fat percentage.

Leptin is an adipokine that increases caloric intake. Insulin and leptin levels increase after caloric intake or while waiting for a meal. In obese people, disrupting cellular signaling factors and neuroendocrine mechanisms of energy expenditure affects the body's capacity to burn the excess adipocytes [6]. Leptin receptors are found in the central nervous system but also in the liver, heart, kidneys, lungs, gonads and adipose tissue. Over the past decades, studies have shown that the white adipose tissue expresses thousands of genes and involves hundred of types of proteins. Obesity has a systemic effect through an altered vascular function, the instability of extracellular matrix proteins, free fatty acids, glycerol, as well as adipokines levels [6]. Oncological diseases might be considered a threat to individuals with obesity [7].

It is known that AMP-protein kinase (AMPK) is a sensor of cellular energy, along with PI3K and mTOR, which are involved in adipogenesis. Their presence shows either the presence of metabolic syndrome when the enzyme PI3K is present or vascular damage when PI3K, AMPK, and mTOR are detected [8]. When PI3K, AMPK, and mTOR are present, or only PI3K is present, AMPK shows a low grade of inflammation. Leptin is responsible for blocking AMPK activation and partially stops the oncogenic antiproliferative effect [8]. Protein kinase B (PKB), also known as Akt, is a serine-threonine kinase that belongs to the same family of protein kinases A, G and C (AGC). These three human isoforms have been identified (PKBα or Akt1, PKBβ/Akt2, PKBγ or Akt3), and Akt influences several biological functions such as metabolic rate, cell division and proliferation through phosphorylation and the activity of cellular compounds such as glycogen kinase [8].

Findings

Underlying gene expression lies the process of epigenome recodification through epigenetic changes. Unhealthy behavioral patterns are the result of familial, traditional, ethnic, work-life, social media influences, health policies, food industry and public transport sector activity. Conditions like cardiovascular diseases, diabetes and cancers are mostly preventable

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by addressing the most common behavioral and dietary risk factors. Obesity-related conditions, such as cardiovascular and oncological diseases, are nowadays very common due to the following risk factors: a high value of the body mass index, an unhealthy diet, a sedentary behavior, and tobacco or alcohol use [9]. Asthma, chronic obstructive pulmonary disease, as well as other bacterial or viral life-threatening respiratory diseases, might interact with the risk factors mentioned above. High blood pressure, high blood sugar and obesity are key risk factors that increase susceptibility to noncommunicable diseases by weakening the immune system and increasing inflammation [10]. Obesity and a sedentary lifestyle are usually associated with metabolic syndrome. A high BMI value requires behavioral interventions to avoid atherosclerosis and coronary artery diseases [11]. Over the last two decades, modifiable metabolic risk factors were considered: high systolic pressure, high LDL cholesterol, and a high fasting glucose level. Some authors consider that by addressing the three main health risk factors (hypertension, unhealthy dietary factors and hypercholesterolemia), diabetes can be better prevented, delayed or managed as a consequence of better-fasting blood sugar levels. Additional studies are needed to analyze the epigenetic changes involved in the obesity pandemic.

Future directions

Aging does not usually mean weight gain and poor health status. Health benefits of long-term lifestyle interventions show improved health outcomes and a better quality of life, significantly reducing the burden of all obesity-related health issues [10]. Preventing such diseases includes cost-effective preventive strategies such as screening, targeted therapy and behavioral interventions. The overall health depends on new strategies envisioned to raise access and ability for more convenient and affordable nutritious food and beverage products. Cardiometabolic and cancer prevention also includes health and food policies centered on better lifestyle interventions, such as nutritious, healthier, improved dietary purchases and daily sports activity [12]. Also, better food advertising and labeling might prevent weight gain [12]. A healthy lifestyle might decrease the burden of diseases globally, as well as the estimated morbidity and mortality rates [3]. Also, the population's well-being can be assured by implementing effective marketing strategies such as better nutrition labeling on food and beverage products [12].

Conclusion

The economic costs of treating obesity and obesity-related diseases are increasing in many countries. The costs of all health expenditures are due to being overweight, negatively impacting the quality of life, work productivity and health status [13]. In order to reduce public and private sector costs, national health institutions should center their activity on screening and preventing obesity-related diseases [13]. By developing a better public healthy policy, future generations' longevity and well-being might be better assured, and the workforce and direct investments in the health sector might be enforced.

Conflict of interest

The authors declare no conflict of interest.

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