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Review

Obesogenic behaviors, impact on the general population

Mariana Spătărelu, MD, PhD student[1*], Amorin Remus Popa, MD Professor[2]

[1] Faculty of Medicine and Pharmacy, University of Oradea, Oradea, Bihor Country, Romania
[2] Clinical Emergency Hospital of Oradea, Internal Medicine-Diabetes Department, Oradea, Bihor Country, Romania

*Correspondence to: Mariana Spătărelu, Faculty of Medicine and Pharmacy, University of Oradea, 1 University Street, Oradea, 410087, Romania

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Abstract

Obesity is a chronic multifactorial, multisystemic disease, responsible for 4.7 million premature deaths annually. The epidemic of obesity is an important challange for public health all across the world. Now more than ever, obesity affects globally both developing countries and wealthy societies. In Europe, for example, more than half of the population is affected by adiposity. Obesity-related diseases are responsible for the reduction of the life expectancy with almost four years. Rising prevalence of obesity increases the risk of debilitating multimorbidity and mortality. Personal behaviors such as diet, physical activity, screen time, stress levels have an play a key role in the efficiency of individual interventions and comorbidity prognostic. Nowadays, the excessive weight gain at the population level leads to an increasing burden of cardiometabolic comorbidities.

Keywords: adiposity, obesity, metabolism, behavior, diet, physical activity, diseases

Problem Statement

Urbanization and globalization are main contributors to adipogenesis. Obesity defined as excess adiposity for height. Obesity increases the risk of chronic diseases due to metabolic dysfunction [1]. Adiposity is one of the most threatening health issues, affects the quality and the longevity. Nowadays, the modern unhealthy behavior is linked to multimorbidity. Weight gain related to unhealthy lifestyle is one of the biggest killers in the world, leading to a high burden of cardiovascular diseases and type 2 diabetes. According to the World Health Organization (WHO), more than half of all obesity-related non-communicable diseases could be prevented through a healthy lifestyle. The body mass index (BMI) is the gold standard score used in clinical practice to establish the degree of adipose tissue expansion. It is accepted that a BMI higher than 30 kg/m^2 is usually corelated to a high risk of adiposity-related chronic conditions, end-organ damage, impairment and lowers quality of life through multimorbidity and impairment [2]. Cardiovascular and metabolic diseases are the most common causes of death in developing and developed countries. Guidelines recommend risk assessment in primary care (age, sex, ethnicity, family history, smoking, alcohol consumption, sedentary behavior, increased blood pressure, elevated fasting glucose, increased triglycerides, decreased high-density lipoprotein cholesterol, increased low-density lipoprotein cholesterol, central obesity) and periodic individual screening of blood pressure, heart rate, weight and waist circumference. Romania is the second leading country in Europe in terms of all-causes death[3]. Also, the Romanian population has the lowest life expectancy in Europe, reflecting unappropriated behaviors and socioeconomic issues.

The actual burden of chronic diseases is on the rise mainly due to the most common health risk factors as unhealthy eating, tobacco use, low physical activity and binge drinking. According to WHO, two thirds of the Romanian population is sedentary and almost three fifths of the adults do not consume fruit and vegetables [4]. A range of anthropometric, behavioral and sociodemographic factors are associated with risk factors as unhealthy diet and physical inactivity [3]. Adipocyte expansion is linked to hypercaloric, lipid-rich, carbohydrate-rich meals. Along with the urbanization process, negative lifestyle changes lead to a lower consumption of fruits, vegetables, fiber rich grains and to a lower ability to perform physical activity [5].

Background

The progress in technology and communication engineering, generated an increased screen-based time, which lead to a reduction of daily sports activity at the population level. In Europe, one in three individuals avoids engaging in a physical activity routine. Recent data shows that the amount of time spend sitting also shows 40% [6]. Thus, weight gain trends are increasing due to a lower adipocyte burn rate [4] and lower thermogenesis than in the previous generations. Evidence shows that negative behavioral patterns have been found to lead to a decreased level of the physical activity in the neighborhood and surroundings. Lifestyle interventions and pharmacotherapy centered on reduction of energy intake, increased metabolic rate, lower cardiovascular and metabolic risk are preventing and delaying onset of an array of debilitating conditions such as diabetes, stroke, ischemic heart disease, diabetic neuropathy, osteoarthritis, obstructive sleep apneea and obesity-hypoventilation syndrome. Lifestyle policy centered on appetite, energy intake and proactive environment may lead to positive outcomes in developed countries. There is a need for better health policies centered on lifestyle practices as energy intake control, physical activity and proactive environment [4]. Eating healthy food is an important factor for overall good health. The reaction to food stimuli along with a baseline physical activity may predict the weight regain after weight loss interventions [7]. A good quality diet consists in a daily intake of fruit and vegetables leading to a better control of the body fat total percentage and a healthy weight range, as a a result of high dietary fiber intake [7]. The daily recomanded quantity of such products are at least one fruit and one portion of vegetables [8]. It is well-known that cost, taste and food safety are key factors that may improve a health, diet adherence as well as the quality of life. Thus, the degree of knowledge about effective lifestyle actions centered on food quality and baseline exercise lowers weight regain variability after weight loss interventions. The low cost of fast food, the large variety of junk food, along with the big portion size are factors that influence the individual's daily excess calories and eating habits. Also, diets low in fiber, rich in sugar and fats are linked to obesity [9]. Dieting is not enough in order to proper manage the weight issues, individuals must gradually increase the intensity, frequency and timing of physical activity [9]. The impressive progress of technology, communication and entertainment industry decreased physical activity levels [4]. Changes in the build living environment can account for the influences of behavior formation and behavior change. Daily physical activity improves health status and reduces the risk of developing non-communicable diseases [7]. Worldwide, physical inactivity is estimated to be the primary cause of approximately 21–25% of breast and colon cancers, 27% of diabetes and approximately 30% of ischemic heart disease [4]. The recommended amount of cardiorespiratory fitness for a healthy individual per week is at least 150 minutes of moderate physical activity or 76 minutes of high levels of physical activity, in addition to other activities involving movement as active transportation, house chores, gardening and recreational sports activities [9]. Isotonic and isometric muscular contraction (in high and moderate-intensity physical activity) leads to [10]. It is well-known that moderate-to-vigorous exercise improves the quality of life through a better attention, perception, cognition, memory, a higher processing speed, better emotion control, ability to self-monitor personal

behavior, to initiate tasks, to organize daily activities, plan future actions and also a better quality of sleep. Physical activity increases serotonin levels, boosts immune-response to stressors, infections, prevents and controls non-communicable diseases and psychiatric disorders, such as anxiety or depression [11]. Also, daily physical training along with healthy dietary principles, high quality aliments, micronutrient and macronutrient dense meals, boost the metabolic rate. The city planning, the physical activity opportunities (green spaces, built environments for recreation), the public transportation availability level up community's engagement in physical activity [11].

Aims and Research Methods

Data shows that more than three quarters of the disability burden and mortality in the European Region are interconnected with non-communicable diseases, including obesity, cardiovascular diseases and type 2 diabetes [4]. Physical, socioeconomical, educational and environmental factors have a negative impact on behavioral patterns. The aim of the research was to analyze recent data concerning the main behavioral risk factors in the Romanian population. Behavioral risk factors are responsible for more than half of the deaths in the European Region. Romania is one of the countries in the region with the lowest life expectancy. Using the latest available data we analysed the average daily kilocalorie consumption. We included the most common consumed aliments, such as wheat and products, milk, eggs, meat, nuts, fruits, vegetables, oil crops, animal fats, sugar and alcoholic beverages. Also, we evaluated the impact of the most common risk factors on the Romanian population, as well as the health outcomes. We interpreted morbimortality statistics of the most prevalent diseases in Romania. In the analysis, behavioral aspects, physical environment and socioeconomical factors were included. The deadliest diseases in the region were evaluated in correlation to health risk factors[4], such as (dietary saturated fatty acids, trans-fatty acids) and physical inactivity. Results showed that cardiovascular and metabolic diseases are the most prevalent[4]. Available data shows also that globally, physical inactivity is responsible for almost 21–25% of breast and colon cancers, 27% of diabetes and approximately 30% of ischemic heart disease [4]. A high score of the BMI, unhealthy dietary patterns, low levels of physical activity, lead to a lower quality and shortening of the life. A BMI higher than 30 is closely related to a higher probability of blood pressure oscillations, higher LDL levels and serum glucose levels, leading therefore to an increased cardiovascular and metabolic risk [12]. In order to establish the precise health impact, clinicians use scores and risk charts. Many studies show that a person with obesity has a two-fold higher risk to develop cardiometabolic syndrome. For individuals with morbid obesity, this risk is ten times higher [13].Cardiovascular diseases, mainly ischemic heart disease and stroke, remain the leading causes of lost years of life [14]. Surprisingly, global estimates show that half of the adult mortality is caused by cardiovascular issues, followed by diabetes [4]. Cardiometabolic risk is linked to traditional bio-clinical risk factors such as hypertension, insulin resistance, dyslipidemia, a proinflammatory profile, the central disposition of the adipose tissue[15]. Thus, behavioral negative factors that decrease metabolism, such as the amount of time spend sitting, the lack of consumption of nutritious dense food play an important part in assessing the probability of cardiovascular or metabolic events. It is well known that adipose tissue dysfunction leads to excessive ectopic accumulation, local inflammation, insulin resistance, lipotoxicity, increases the cardiovascular and metabolic risk [15]. In prolonged negative energy balance conditions, including dietary restrictions and increased energy expansion such as walking between 4000 and 18,000 steps/day, health outcomes are improved, while walking 7500 steps per day boosts cardiovascular function [16].

Cardiometabolic Biochemical Risk Factors

Visceral and ectopic adiposity elevates cardiometabolic risk through cytokines that

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mediate inflammation and through adipokines which control glucidic and lipid metabolism [17]. These metabolic disruptions are involved in the developement of hypertension, dyslipidemia, hyperglycemia and thrombosis. Also, chronic inflammation of the adipose tissue leads to a lower immune adaptability to cellular stressors [17]. Adiposity is related to a higher adrenergic vascular reactivity, higher cortisol levels, hyperhomocysteinemia, high C reactive protein, low HDL levels, high triglycerides, high plasma levels of fibrinogen, high β-tromboagglutinin levels, inactivity of tissular plasminogen and mycroalbuminuria [17].

Findings

In the next three decades, overweight, obesity and overweight-related diseases might reduce life expectancy by nearly three years. Behavioral factors have a powerful impact on the health outcomes, life expectancy, morbidity and mortality. A 20% reduction of calorie content in energy-dense foods will reduce almost 1.1 million cases of non-communicable diseases and would avoid health costs [1]. Food intake and physical activity are considered key determinants of BMI score and obesity related comorbidities. Healthy diets are five times more expensive than regular food and remain unaffordable for more than 3 billion people in the world, leading to an increasing trend of obesity. For low-income and middle-income individuals, protein-rich foods, diary, fruits, vegetables are considered high-cost food groups [17].

When purchasing food, individuals living in the Europe are more concerned about taste (45%), food safety (42%), cost (40%) over sustainability concerns, such as food source (34%) and nutrient content (33%) [21]. A healthy and sustainable diet involves eating a balanced diet, rich in fruit and vegetables. Two in five persons living in the European Region do not include in their diet fruit or vegetables. Also, more than half of the population in Europe avoids eating seasonal food products (53%) and home-cooked meals (57%) [21]. Daily intake of high fat products, sugar and salt increase weight gain, overweight and obesity [22]. Although, in Romania, the rates of overweight and obesity are lower than in most countries of the world [22], data shows that the prevalence of obesity increased from 8.3% in 1975 to 22.5 in 2016. Over the past ten years, in Romania the main risk factors were high blood pressure (40%), high cholesterol levels (20%), obesity (20%), physical inactivity (31%), insufficient consumption of fruit and vegetables (29%), smoking (28%) and alcohol consumption (14.4 liters per year) [5]. Romania has the lowest consumption per capita of fruit and vegetables in the European Region. Data shows that two thirds of the Romanian population avoids eating the recommended daily amount of fruits and vegetables [19]. Romania has also the highest rates of avoidable deaths (31.9%) in Europe and more than half of them can be attributed to a lack of effective primary prevention and public health interventions [20]. In Romania, the population neglects behavioral and lifestyle factors that might improve health outcomes [7]. The age-standardized mortality rate is used as an indicator for health systems performance. Both the treatable and preventable mortality indicators for the Romanian population are the highest in Europe. The share of avoidable deaths reached 80.1% of the total deaths registered in the country, compared to the Europe average of 68% [7].

According to the latest INSSE (National Institute of Statistics - Romania) data, the highest obesity rates in Romania are in Mehedinți, Arad, Bihor Countries [1]. As for the calorie intake, the consumption of wheat in Romania per capita is high. In 2018, for example, the daily intake of cereals and other grain products was about 952 kcal.

Between 2014 and 2018, the average consumption of fruits, vegetables and nuts in Romania were lower than the sugar the intake. The data shows a daily consumption of 45 kcal of fruits, 90 kcal of vegetables and 19 kcal of nuts. Otherwise, the daily amount of sugar consumed was about 247 kcal. The daily intake of basic products in Romania is almost one medium egg, meaning 49 kcal/capita/day, 437 kcal/capita/day of milk-based products, 48 kcal/capita/day of oil crops, way lower than the consumption of animal fat 133 kcal/capita/day. [17] More than one third of adults in Romania engaged in episodic heavy alcohol consumption (binge drinking) at

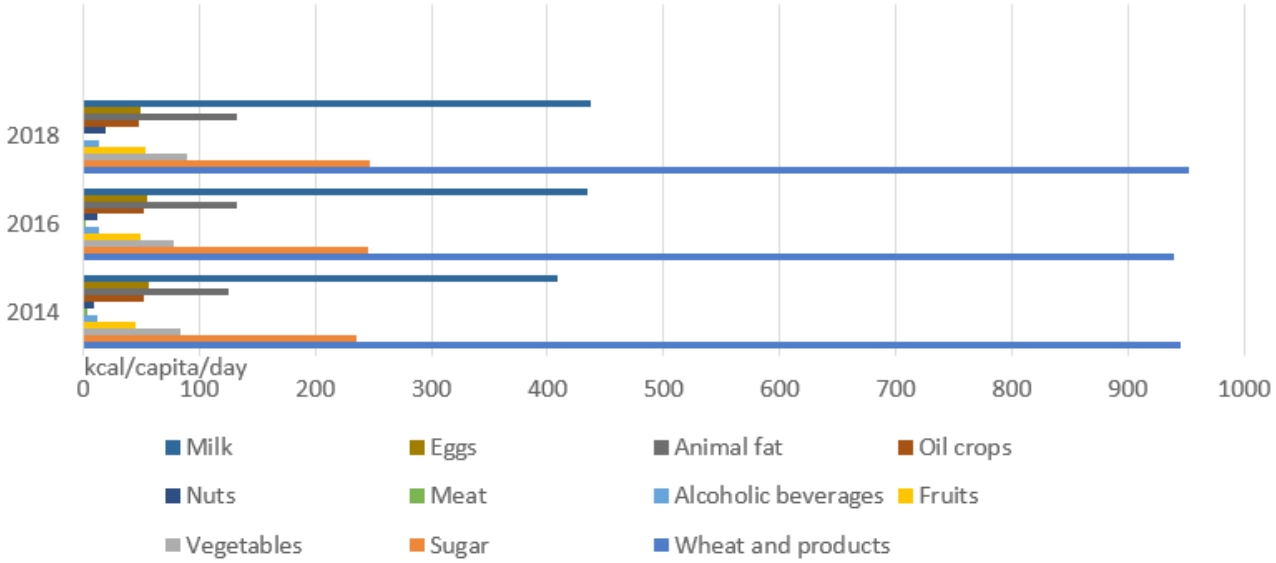

Figure 1: Average daily kilocalorie consumption in Romania (own chart). Data Source: Eurostat data.

least once a month, the second highest rate in the EU (35% compared to 20% on average in the EU). Moreover, there is a strong gender difference, with more than 50% of men reporting having engaged in heavy drinking. Dietary risks include more than ten components, such as low fruit and vegetable consumption, high sugar-sweetened beverage and salt consumption [23]. On the other hand, a Computer Assisted Telephone Interviewing realized on 1030 respondents between 7 and 8 January 2021 showed that more than half of the men refuse to diet (61%). Almost half of the women (45%) were planning to lose weight [23]. Surprisingly, our data shows that the Romanian individuals in the lower socio-economic status are less predisposed to develop overweight and obesity. On the other hand, people who live in cities whose age is more than 51 years are more interested in dieting [23]. According to WHO, only 30% of the Romanian population is practicing sports [4]. Another similar Computer Assisted Telephone Interviewing Survey, realised on 1085 persons living in Romania, between 18 and 21 December 2020 included the analysis of the use of the personal and public transportation. More than half of the participants to the study used public transportation were women (61.0 %) [24]. The collected data shows that almost 70% of the persons aged 18–65 years use more often the public means of transportation. More than half of the individuals aged more than 65 years, transit the community via local public transportation (51.9 %) [24]. The men (67.4%), as well as the 18–35 years category of individuals (68.8%) and the persons with a high level of education (75.3%) drive more often than the low education category of population. The study showed that individuals with a a lower educational achievement travel more often by bus, trolleybus, subway or trains [24]. Also, the same study shows that almost half of the respondents drive. Most of the respondents (67.4%) who drive a car are men with a higher education level. Data also showed that people aged between 18 and 35 years drive more often (68.8%) [24]. Thus, a slightly lower percentage of drivers' age between 36 and 59 years (59.0%), 14.5% of the Romanian individuals who age more than 65 years drive their own car [24].

Strengths and Limitations

Obesity is a progressive, multi-factorial disease, characterized by adipose tissue dysfunction. Lifestyle changes, behavior therapy, individualized pharmacological and surgical interventions have their place, as well as limitations, in the obesity treatment [25]. Lifestyle modifications should be pursued in all patiens with obesity before pharmacotherapy and bariatic surgery in order to reduce cardiometabolic risk. Added value of this study: In Romania, the diet is

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based on wheat-based food products, milk products, sugar and animal fat. This dietary pattern decreases cellular adaptability, decreases metabolic flexibility, leading in time to an increased risk of insulin resistance, obesity and cardiovascular diseases. We estimated that the daily intake of these aliments reduces cellular thermogenesis, decreases mitochondrial function leading to low adenosine triphosphate levels, low metabolization of glucidic and lipidic elements. We searched for solutions to increase biodisponibility of cellular adenosine triphosphate through positive behavioral and dietary patterns at the population level. The effective control of neurochemical substrates of appetite, stress, blood sugar, emotions, stress reactions are tied to metabolism and weight loss interventions. Populational behavioral modifications, meaning the reduction of psychophysical stressors, the avoidance of the most important health risk factors, lead in time to better compensatory responses,

an effective metabolic energy balance, a better quality of life and a healthy weight.

Limitations: There is a lack of populational studies concerning the relationship between behavioral, environmental factors and the ascending obesity related burden of disease. Future research should also identify the correlation genetic polymorphism, adipose percentage and disposition, dose-response exercise activity levels, alongwith effective dietary patterns, in order to reduce biochemical markers and the early onset of diseases.

Discussions

Obesity reflects unhealthy behaviors, socioeconomic inequalities at the population level, as well as well as socioeconomic deficiencies. in health systems. Reducing the obesity burden requires complex approaches that adapt individual interventions to the environmental and societal changes [25]. Lifestyle and behavioral interventions aimed to provide a better health status, promoting the reduction of sugar, salt, caloric intake and increasing energy expenditure. Medical professionals have to be involved in counseling patients, encouraging behavioral modifications in patients at intermediate and high risk of developing cardiometabolic diseases. Sustained individual efforts are needed to maintain cardiovascular benefits of weight loss interventions or pharmacotherapy.

Obesity-related non-communicable diseases might be prevented through the reinforcement of local strategies. Therefore, the burden of disease and the public care health costs can be considerably reduced [24]. Diet adherence, the portion size, pricing, the availability of nutritional dense food products are involved the rising prevalence of burden of obesity-related diseases [24]. Population strategies that address qualitative food and beverages, active living promotion and safe living environments may provide a healthier and performance of the workforce [4]. In order to reshape the context of health policy, a multilevel approach is needed. Recomandations in local guidelines, mass-media interventions, high-quality screening interventions, medical counseling (healthy lifestyle, reduction of risk factors, BMI/ body fat percentage/central adiposity) have proven positive outcomes over the past decades in the reduction of non-communicable diseases in many developed countries. Local national screening programes of the patients at risk, along with clinical cardiometabolic risk estimations and evaluations, help identify diseases at an early stage and prevent future medical negative events. The reinforcement of strategies addressing sustainable health and socio-economic development goals is needed in order to prevent multimorbidity [4]. Also, sustainable active transportation, walkable and bikeable neighborhoods, are very effective in reducing the impact of obesity-related acute and chronic diseases.

Conclusions

Tackling the obesity pandemics is a challenge for public health services all around the world due to it's powerful impact on acute and chronic diseases, such as cerebrovascular, cardiometabolic, peripheric vascular disease, thereby contributing to a decline in both quality of life and life expectancy. The interaction

between genetic and environmental factors lead to a low energy expenditure and increase the prevalence of obesity [26]. In people with obesity, positive outcomes in weight reduction is a challenge because of a lower compliance to lifestyle and behavioral interventions, pharmacotherapy or bariatric surgery. While diet, exercise, caloric restriction, smoking cessation, may improve cardiometabolic scores, health risks often remain the same for several moths due to ineffective neurohormonal modulation [25]. In many countries of the world, despite the efforts aimed to improve prevention of obesity-related chronic diseases through governmental campaigns, obesity-related noncommunicable diseases remain a public health concern, affecting the entire population. Looking ahead to the future generations, actions must be taken at micro and macro levels in order to raise awareness of the obesity issue and to reduce the threat for the public health systems. State legislators and policymakers need to focus their attention on family-friendly healthy life strategies, centered on the control of main health risk factors and screening.

Conflict of Interest

The authors declare no conflict of interest.

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