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Analysis of the role of education and sport in the heavy burden of obesity

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Abstract

Introduction and purpose

Obesity has become the global pandemic of the world. The epidemiological rise has only happened in recent decades. Unfortunately, the disease affects people of all ages. The most prominent characteristics of the disorder are excessive fat accumulation, body mass index exceeding the number of 30, and general lowering of the quality of life. The consequences are

observed in the whole organism. The disruptions affect one's overall homeostasis. Certain diseases are specifically associated with excessive fat mass. When not properly managed, obesity leads to chronic illnesses and severe comorbidities, the most morbid one being death. Thus, effective therapeutic approaches are needed. Focus on education and physical activity are the best way to tackle this problem.

Material and methods

The aim of this study is to check the factors and changes necessary to lose weight in obese patients in Poland. The main question regarded the role of sport and proper education in maintaining or losing weight in the Polish society. In order to analyse the issue, an Internet survey was prepared and disseminated in March and April 2023.

Results

Over half of the respondents have ever used a diet. Over 8 out of ten of them achieved the success in the set task. When asked about physical activity, the most respondents chose option 30-60 minutes per day. The preferred type of physical activity was most commonly walking. When asked if sport enabled the respondents to lose or maintain weight – 63,5% confirmed. 72% of respondents experienced education regarding healthy lifestyle, most commonly at home. Over 60% of respondents believed they were well informed about recommended behaviours. Over 50% of them confirmed their education is sufficient to lose weight.

Conclusion

Maintaining healthy regimes is key to a healthy life. However, not all people are properly educated how to do that. In fact, there is a tendency of overestimation of one's education in those topics. All in all, proper experience and routines are necessary.

Key words: obesity; sport; education; weight management

1. Introduction and purpose

Nowadays, obesity is one of the most common medical issues in both children and adults. However, this pandemic has only begun in the 1970s [1]. The Global Burden of Disease Group estimated that in the last 40 years, the prevalence of this disease has increased twice in over 70 countries worldwide and significantly in many others [2]. There is no doubt the high epidemiological rise in the number of obese patients is a result of improper and unhealthy lifestyles, bad eating behaviours along with lack of physical activity. For a long time, it was

universally claimed that obesity should not be classified as a medical condition, but rather as a dangerous risk factor like smoking cigarettes, hypertension, or hypercholesterolaemia.

The general recognition of obesity being a chronic disease started only in 1985 [3]. Although since that year it has been gradually receiving proper attention and public awareness, overcoming its burden still seems impossible. Experts have been continuously stating that if 'post-2000 trends' prevail - as in unhealthy eating habits, lack of nutritional and physical education, and neglect of overweight patients leading to obesity – then it is close to impossible to meet the global obesity target, which is reducing the number of obese individuals by half by 2025 [4]. Indeed, current epidemiological data proves the war against the obesity pandemic does not seem to end. The comorbidities of this condition pose a great risk to one's health and life [5]. That is why it is so crucial to properly educate people about the necessary dietary habits, physical exercises, and healthy lifestyles. All the evidence shows that neglecting the care for a balanced lifestyle, proper diet and the right amount of physical activity only leads to not only the deterioration of one's health but also to morbid chronic consequences, the gravestone being death.

This chapter aims to summarise current knowledge regarding obesity, its comorbidities, and implications. It also describes the necessity of not neglecting the problem and its consequences. The mentioned information highlights the need of conveying a survey regarding proper management of obesity in the Polish society.

1.1 The clinical picture of obesity

Obesity is commonly described as a pathological disorder with an excess of fat departures in contrast to standard amounts in individuals of the same sex and age [6]. Generally, it has always been more prevalent in adults. Unfortunately, recent years show a rapid increase in the number of obese children [7]. Childhood obesity still stands as a high-risk factor for developing severe chronic illnesses. Medically, obesity can be pronounced when a patient's body mass index (BMI) exceeds the number of 30. BMIs are measured and optimised differently for every ethnicity. Thus, the waist: height ratio is also measured with the indication of obesity of ≥ 0.5 [8]. It also largely impairs the standard homeostasis of the human body and influences the general physiological balance and metabolism [9]. The disease has an impact on, to name a few, cardiovascular, pulmonary, endocrine, and immune systems. Noteworthy, it affects a patient's whole body and even mind, as it can contribute to depression and other psychiatric diseases [10]. If not handled correctly, it can cause great

health issues and even endanger one's life. In this chapter specific changes in various physiological norms are described. Common comorbidities along with risks of exacerbations or chronic illnesses are also noted.

1.1.1 Cardiovascular system

An excessive amount of adipose tissue affects the cardiovascular system in multiple ways. Cardiac output is seemingly increased in obese patients, which consequently affects the heart to work harder and faster. As the excess accumulation of fat creates a bigger demand for metabolic supplementation, blood volume is bigger, adequately leading to high blood pressure [11]. Hypertension is indeed rooted in hormonal, endothelial, and inflammatory disruptions [12]. Problems regarding the control of proper blood pressure are truly common in obese patients. As a result of that, the hypertrophy of the left ventricular along with its dilation is observed [13]. The dyslipidaemia of obesity additionally encourages the process of atherosclerosis. Moreover, obese patients are more likely to experience venous thromboembolism due to their disturbed hematologic parameters [14]. Some of the highest consequences of these implications are the elevated risks of myocardial infarction and stroke, the two biggest death causes in obese individuals [15]. What is more, in obese patients a phenomenon named 'obesity cardiomyopathy' can be observed. It is a result of accelerated structural and hemodynamic alterations in the cardiovascular system. They simultaneously lead to congestive heart failure, which gradually leads to aggravating of patient's overall quality of life [16]. The disease mostly appears in people with severe and long-lasting obesity. The most possible fatal consequences are progressive heart failure as well as sudden cardiac death [17]. The described changes in the cardiovascular system are strictly correlated to pathologies occurring in the respiratory system, such as sleep apnea or shortness of breath [18]. To sum up, the cardiovascular system is highly affected in patients with excessive amounts of fat. Plenty of chronic illnesses are directly caused or influenced by the pathological processes occurring in obese patients.

1.1.2 Pulmonary system

With excess mass accumulation, the demand for oxygen and proper gas exchange are needed. Therefore, in patients who developed a metabolic syndrome decreased lung function and alterations in respiratory processes are observed along with changes in the mechanics of the

chest wall [19]. Visibly, patients diagnosed with severe obesity have trouble breathing properly. Moreover, there is an additional association between excessive adipose tissue and the increase of inflammatory cytokines production, with the result of a higher risk of developing comorbidities [20]. Certainly, one of the most prevalent respiratory diseases in obese patients is asthma, with a significantly higher incidence than in non-obese people [21]. Mentioned patients are said to develop more frequent and severe symptoms and exacerbations, show a decreased response to treatment, and have a lower overall quality of life [22]. Obese children are especially prone to developing severe and tough cases of asthma in adulthood. All in all, the heightened inflammatory response present in obesity visibly results in airway inflammation and allergic diseases exacerbation [23]. Sleeping disordered breathing is also highly persistent in patients with an elevated BMI Index. The symptoms range from intermittent snoring to even ischaemic stroke [24]. What is more, chronic pulmonary disease and sleep apnea-hypopnea syndrome occur frequently [25,26]. The disease specifically more prevalent in obese patients appears to be obesity hypoventilation syndrome in which distortion of breath during sleep and awake diurnal hypercapnia are also present [27]. On the one hand, common adversaries are for instance daily drowsiness and cognitive dysfunction. On the other hand, untreated disease may lead to fatal consequences such as pulmonary hypertension and right heart failure [28]. Essentially, the pathologies connected to excessive mass accumulation which are present in respiratory and cardiovascular systems are intertwined and simultaneous. It is also worth mentioning that the higher the body mass in patients, the more elevated risk of developing exacerbations from viral pulmonary infections. This dependence was meticulously documented especially during the COVID-19 pandemic [29]. Obese patients are believed to be more likely to, naming a few, intensive care unit admission, the necessity of mechanical ventilation, and an elongated hospital stay in comparison with non-obese people [30]. In conclusion, pulmonary disorders are highly common in obesity along with their comorbidities drastically affecting patients' overall quality of life and homeostasis.

1.1.3 Endocrine system

It is generally known adipose tissue has an endocrine and regulatory activity through producing and stimulating adipocytes, cytokines, especially pro-inflammatory, adipokines [31]. The proper balance of these products is essential to maintain homeostasis in the organism. The excess of adipose tissue heavily contributes to pathophysiological fluctuations of

mentioned cells, which plays a pivotal role in dysregulating the endocrine system [32]. The abnormal stimulation of the immunological and inflammatory processes leads to overall hormonal disorders. Hyperinsulinemia, hyperglycaemia, and dyslipidaemia are also present. The manifestations of such changes are the most common metabolic syndrome, insulin resistance, and obesity [33,34]. It has been proved that obesity is the most influential environmental factor in the prevalence of diabetes [35]. To understand the mechanisms behind these disorders it is crucial to note the rise in free fatty acids and glucose production in obese patients [9]. Adequately, the pancreas is stimulated to secrete more insulin, and, gradually, sensitivity to insulin decreases [36]. As a result, insulin resistance (IR) develops, in which glucotoxicity and acceleration of β -cell apoptosis are present. Moving forward, increased immunogenicity in cases of patients with at-risk may lead to diabetes mellitus (DM) [37]. The disorder can be diagnosed when the blood glucose level 8 hours post meal is >126 mg/dl or when 2 hours postprandially blood glucose is >200 mg/dl [38]. Curiously, childhood obesity is found to be a giant factor in developing DM type 2. The main consequences of this disease are structural damage as well as pathological function and failure of various organs. To name a few, the kidneys, eyes, heart and blood vessels, nerves and the whole brain can be affected [39]. The long-term detrimental effects include for instance higher incidence of infection, polyneuropathy, renal failure, and death. In the most severe cases, insulin therapy is needed [40]. Similarly to the abovementioned diseases, obese patients are likely to manifest the metabolic syndrome, which usually takes years to develop [41]. Its characteristics consist of increased IR, hypertension, dyslipidaemia, and, obviously, obesity [42]. The disorder heightens the likelihood of comorbidities such as coronary artery disease, stroke, DM, and peripheral vascular disease with the most dangerous venous thromboembolic events [43]. In addition to the mentioned diseases, it is crucial to list the pathophysiological changes regarding other parts of the endocrine system [44]. Obesity is said to disrupt the hypothalamic-pituitary reproductive axis by inducing male hypogonadism and female hyperandrogenism with infertility [45,46]. A decrease in growth hormone, hypercortisolaemia (the disruption of the hypothalamic-adrenal axis), thyroid dysfunction, vitamin D deficiency along with dysregulation of the renin-angiotensin-aldosterone system are also notably present in obese patients [47-50]. All in all, the endocrine system is highly affected by obesity and undoubtedly prevents homeostasis.

2. Material and method

To analyse the aforementioned issue, a 14-question questionnaire was prepared. The survey was created using Google Forms programme and distributed via Facebook groups between May 18th and June 18th, 2023. It was eventually filled in by 200 people.

The first part of the survey contained general information about the respondents including age, gender, or place of study. Questions specifically related to the topic, describing various questions about weight and its management were gathered in the second part of the survey.

Open question about age was the first one from the first part of the survey. Second one referred to the gender (division into two genders: female or male). The last question gained information about the recent place of study (primary, secondary, high school, university or “I do not go to the school anymore”).

The second part of the survey began with a question about respondents’ weight, as they were asked to select the option with their BMI (<18.5 – underweight, 18.5-24.9 – healthy weight, 25.5-29.9 – overweight, 30.0 and above – obesity). Question number five checked if they have ever used, or now use, any diet specifically to lose or maintain weight. If yes, if implementing this diet was successful in completing its task. In the next question respondents chose the type of dietary preferences they have (none, vegetarian, vegan, mostly meat, fast foods).

Seventh question gathered information about the amount of physical activity in respondents’ lives (less than 30 minutes per day, 30-60 minutes per day, 1-2 hours per day, over 2 hours per day). Next question regarded the type of preferred physical activity and was a multiple choice with options walking, running, strength exercises, swimming, yoga. In the ninth question respondents were asked to estimate how many times per week their physical activity leads to the feeling of tiredness, with the options of 0 times, 1-3 times, and over 4 times. The next question asked if the mentioned physical activity enabled respondents to lose weight or maintain it.

The eleventh question was about healthy lifestyle – if the respondents have ever experienced education in this topic. In the next question they were asked to choose multiple options - in what forms they have been educated about it (via social media, in school, at home etc.) Question 13 asked if the respondents felt as if they are well informed about proper dietary and physical behaviours. The last question concerned about whether the respondents felt that their

knowledge about healthy lifestyle and sport have ever enabled them to maintain or lose weight.

3. Results

Two hundred people participated in the survey. Most of the respondents were women (74,3%). Age ranged from 12 to 49; the average was 22,12 years and median – 20 years. Most people (98) attended university, 41 high school, 15 secondary school, 8 primary school and 38 respondents had already completed their education.

In the question regarding the respondents' BMI the results showed that 88 (44%) people were in the normal weight, 61 (30,5%) people were overweight, 44 (22%) people were obese, and 7 (3,5%) people were underweight. More than half of the respondents (67%) have used or are currently using a diet to maintain or lose weight. Over 8 out of ten (80,6%) of those people with dietary regime confirmed the success in completing the set task. This question did not concern 33% percent of respondents. When asked about specific types of dietary preferences, 144 people (72%) chose none, 12% chose vegetarian, 2% chose vegan, 6% chose mostly meat and 8% chose fast foods.

Next question was the amount of physical activity in one's life. The most respondents – 98 people (49%) chose option 30-60 minutes per day. The second most frequently chosen option was less than 30 minutes per day – 56 people (28%). The following answers were 1-2 hours per day – 41 people (20,5%) and over 2 hours per day – 5 people (2,5%). The multiple-choice question regarding the preferred type of physical activity provided the most frequently chosen answer – walking (by 125 people – 62,5%), then strength exercises (by 90 people – 45%), swimming (by 76 people – 38%), running (by 64 people – 32%). The least frequently chosen option was yoga chosen by 43 people (21,5%). When asked about the estimated amount of times per week when exercising led to feeling of tiredness most respondents chose the option 1-3 times a week (137 people – 68,5%). Option 0 times was picked by 42 people (21%), and option over 4 times was picked by 21 people (10,5%). The next question asked if mentioned physical activity enabled the respondents to lose or maintain weight – 127 people confirmed (63,5%).

The eleventh question regarded the experience of education in healthy lifestyle topics in respondents' life. 72% of them confirmed that they have experienced any form of educational content regarding dietary habits and physical activity. The multiple-choice question asked about forms and ways of education in respondents' lives. Most of them – 119 people (59,5%) chose at home, 103 people (51,5%) chose at school, 89 people (44,5%) chose social media, 75 people (37,5%) chose by friends, 54 people (27%) chose magazines. In the next question respondents were asked if in their view they are properly educated in topics of health and physical activity. Over 6 out of 10 respondents (121 people – 60,5%) believed they were well informed about recommended dietary and physical behaviours. The last question asked about the opinion of respondents on whether their current education regarding healthy lifestyle enables them to maintain or lose weight. Over the half of the respondents (113 people – 56,5%) confirmed their education is sufficient to complete this task.

4. Discussion

One of the main difficulties in confronting the epidemic of obesity appears to be the disparity between social groups, their backgrounds, and possibilities. It is especially prominent when looking globally. In many cases, generational habits remain the one way to live, which may be tough to break by an individual. This is why it is so crucial to implement proper educational programs adjusted accordingly to specific nationalities, ethnicities, and minorities [51]. Furthermore, it becomes apparent that children struggle with obesity from earlier and earlier ages. Noteworthy, the key factor for excess body fat in children is the obese parent(s) [52]. This indeed highlights the necessity of adequate education regarding lifestyle choices from an early age. Reducing the number of obese children directly equals a lower number of obese adults. Not only that but also proper eating and healthy habits, such as good sleep hygiene, generally help ensure a good quality of life in the future.

Another crucial way of confronting the obesity pandemic is the right amount of sport in one's life. Physical activity not only lowers the body mass but also keeps the organism oxygenated, helps with regulating the hormonal imbalance, and fastens the metabolism. Even moderate levels of training result in benefits to health with a lower incidence of obesity at all ages. As little as 150 min of physical activity per week visibly increases the quality of life [53]. Sport is believed to be advantageous at all stages of life, especially during the formative years. Maintaining a balanced diet is equally essential for the well-being of the body [54]. Both

aspects are the cornerstones of obesity management and prevention. To achieve the best results, expected dietary and active lifestyle changes need to be cohesive with the patient's environmental situation which directly influences behavioural determinants. A practical and well-thought weight management spectrum consists of prevention of weight gain, proper maintenance, management and treatment of obesity and its comorbidities, and, finally, weight loss [55]. One of the challenges that need to be considered in treating obese patients is to note and appropriately address the difference between physical activity promotion and its proper execution. The multiple benefits of even little activities when implemented carefully should motivate every patient to maintain their weight-loss journey. Moreover, in the topic of treating obesity's comorbidities, intentional weight loss is proven to be very effective in improving abnormal hemodynamics and pathologies in the cardiovascular system [56]. Furthermore, studies show that treating diabetes mellitus with specific diets and physical activity becomes a front-line approach with noninsulin-dependent patients [57]. To sum up, sport is one of the most effective ways of managing and treating excessive body mass. It provides not only the loss of weight but also overall fitness and well-being.

5. Conclusions

In conclusion, obesity is a worldwide pandemic that affects people of all ages and ethnicities. The disorder has an impact on the whole organism, disrupting its proper functioning at a cellular level. Pathophysiological changes can be found in every organ, and almost every tissue. It can lead to numerous chronic illnesses that often cannot be fully treated. At its core, obesity is a product of neglect. That being said, when approached at the right time, everything can be changed. Proper education can ensure healthy readjustments in the obese individual's lifestyle, such as implementing a balanced diet along with sports and overall physical activity. As observed in this study, people tend to overestimate their knowledge and experience about health in planning their lifestyle routines. Many of them do not balance properly between dietary regimes and physical activities. The effectiveness of weight loss/maintenance lowers with the inappropriate execution of health recommendations. In fact, obesity is one of the few diseases that can be fully treated without any medications. The most important factor in managing its course is the patient's motivation and determination. Indeed, it is the key to winning the global war for health.

Author's contribution

Conceptualization, M.K. and I.G.; methodology, M.K. and A.G.; software, S.D.; check, N.S., A.K. and P.C.; formal analysis, N.O.; investigation, A.G.; resources, S.D.; data curation, N.S.; writing - rough preparation, M.K., A.K. and P.C.; writing - review and editing, M.K., I.G., A.D., S.D., N.S., A.K., P.C. and N.O.; visualization, P.C. and N.O.; supervision, M.K. and I.G.; project administration, S.D. and N.S.. All authors have read and agreed with the published version of the manuscript.

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