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## OBESITY DEVELOPMENT IN ADULTS AND CHILDREN AS A EFFECT OF PSYCHOSOMATIC FACTORS

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**Abstract:** The aim of this chapter is to explain how psychosomatic factors influence the development of obesity in children and adults. Obesity is one of the most popular chronic diseases, and it puts a person at risk for heart disease. Obesity promotes worry, stress, and depression, as well as affecting self-esteem and acceptance, according to scientific evidence. Obesity is becoming more common among children, which has been linked to bullying and emotional deterioration. As a result, in addition to seeing a dietician, an obese person should seek psychological help.

**Keywords:** obesity, psychosomatic diseases, stress

### Introduction

Maintaining a nutritional status that is appropriate for a given species is one of the basic activities that must be performed so that the individual can develop and reproduce properly. Nowadays, food has acquired many different meanings on the psychological and social background, as well as by the growing consumerism (Davidson 2018, p. 224). Obesity is one of the most common civilization and social diseases in the world. It is a chronic disease that affects over 650 million people worldwide, and since 1975 the number of obese people has tripled. 39% of adults were overweight in 2016 and 13% were obese. 39 million children under the age of 5 were overweight or obese in 2020. (WHO 2021).

Obesity, accompanying humanity since ancient times, earlier testified to prosperity and high social status, and since 1974 in ICD-10 (International Statistical Classification of Diseases and Related Health Problems) described as E66. The following tests are used to assess the nutritional status and type of obesity; BMI (body weight divided by the square of height in meters) and the WHR (Waist to Hip Ratio) index, which consists in measuring the "ratio of waist circumference to hip circumference, and waist circumference measured halfway between the iliac crest and the lower edge of the chest. (Davidson 2018 p. 223, Lollipop, Buzowski, 2016). When examining children, percentile charts are used. And formulas are used to calculate the ideal body weight; Brock, Brugs, Lorentz (Schlegel-Zawadzka, 2015, p. 201). The above methods are helpful in determining the distribution of adipose tissue, but unfortunately they are not entirely precise, for example in people with large

muscle mass, in elderly people who cannot stand. In this case, other methods are used, e.g. measuring the length of the femur or the thickness of the skin fold (6-12 mm in slim people and 40-50 mm in obese people).

Obesity, in addition to increasing the risk of many comorbidities, also reduces the ability to perform basic tasks, sex life, self-acceptance and behavior in society. (Lech, Ostrowska, 2017, pp. 66, 67). It also causes an increase in mortality. Scientific research shows that obesity at the age of 40 reduces life expectancy by up to 7 years in non-smokers and 13 years in smokers (Davidson, 2018, p. 228). In the course of the development of civilization and the economic success that man has achieved, there has been a situation in which man no longer has to fight or hunt. The foods we eat have evolved from eating for survival to eating for pleasure, also meeting our psychological needs, which can eventually lead to obesity. There is even a phrase that describes the types of foods that improve the emotional state of the so-called. "Comfort food" (Kłósek, 2016, pp. 148, 149). Scientific research proves that there is a coexisting relationship between weight gain and higher levels of anxiety and depression. Therefore, this paper will describe the most common psychosomatic factors influencing the development of obesity. In addition, this phenomenon should be looked at among children and adolescents, because, although the prevalence of obesity increases with age, an increasing percentage also occurs in them.

### **Psychological aspects of obesity**

The formation of obesity results from the imbalance between the energy supplied and consumed by the body. The processes responsible for this balance are regulated by the nervous and endocrine systems. The center responsible for regulating these mechanisms is located in the hypothalamus. It is from it that, as a result of sending stimuli and neurotransmitters, information about the current feeling of hunger or satiety is sent. Its excessive stimulation as a result of e.g. stress can cause a constant desire to eat despite a full stomach. The feeling of hunger is responsible, among others, for ghrelin secreted by the stomach and intestines, neuropeptide Y, agouti protein, galanin, orexins A and B. The substances responsible for the feeling of satiety include; leptin, blocking the hunger center (leptin resistance may develop in obese people, resulting in the lack of action of this hormone), adiponectin, insulin, peptide YY (just like leptin inhibits the formation of neuropeptide Y). Leptin secretion is dependent on the amount of adipose tissue. Adipocytes produce leptin in proportion to the amount of adipose tissue, and then transported to the hypothalamus, it inhibits the desire to eat by stimulating POMC/CART neurons and inhibiting NPY/AgRP. It's not just hormones from the digestive tract that affect the amount of food you eat. The regulation of hunger is also influenced by thermogenesis and thyroid stimulating hormone. Therefore, heat or fever, when the body is supplied with a lot of heat, cause a decrease in appetite, in the case of lower temperatures the relationship is reversed (Obara Gołębiowska 2020 p. 29-32, Kumar, Abbas, Aster 2014 p. 335).

Another factor influencing the feeling of hunger is negative emotions. Aggression, stress or loneliness cause an increase in cortisol concentration, which stimulates the secretion of neuropeptide Y, which results in an increase in appetite (E. Estkowska 2017). In addition, the symptoms of stress and hunger are often confused, which are similar. Physiological changes occur, such as: "abdominal pressure, accelerated heart rate, increased sweating, muscle tension or weakness" (Kłósek, 2016 p.147). Then comes to "eating" embarrassing situations, because food brings temporary relief. Frequent consumption of high-calorie snacks to reduce emotional states may result in obesity, which can also be a source of stress. This leads to the "vicious circle effect", which makes obese people more sensitive to the psychological functions of eating (Kłósek, 2016 p. 111). Positive emotions have the opposite effect, during which serotonin is secreted. Increased concentration of glucose and adrenaline as a result of stimulating the 5-HT<sub>2A</sub> receptor causes a faster feeling of satiety. Unfortunately, it also increases insulin resistance, which is why it is assumed that it causes a higher risk of metabolic syndrome (Semczuk-Kaczmarek, Filipiak, Szymańska-Tutak, Płatek, Szymański, Ryś, 2018 p. 424).

Our mood can also affect our sleep. Research confirms that there is a relationship between the proper functioning of the circadian rhythm and metabolic regulation. Melatonin, whose secretion depends on the day-night phase, reaches the highest concentrations at night. In the case of insomnia, the action of this hormone is disturbed, and because melatonin affects the proper secretion of e.g. leptin and ghrelin, the result of its malfunction may be excessive food consumption (Nuszkiewicz, Kwiatkowska, Majko, Wesolowski, Szewczyk-Golec, 2017 p. 228) . It is also worth mentioning that the serotonergic system affects sleep. People who suffer from night eating syndrome, which is associated with insomnia, reach for high-calorie snacks, thus increasing the level of tryptophan, which participates in the biosynthesis of serotonin, and this helps in falling asleep. It is assumed that long-term overeating causes (as in the case of addiction) "reduced brain sensitivity of the reward system" (Lech, Ostrowska 2017 p. 65). To understand the content of this article, it is worth knowing the concept of psychosomatics. It combines two fields, which are medical sciences and psychology, and aims to analyze the relationship between the psychological and somatic state of a person (Tudorowska 2016 p. 122). To better

illustrate this, we can present the classification of psychosomatic disorders proposed by Elżbieta Ścigała (1993, cited in: Tylka, 2000, Tudorowska 2016 p. 125):

-Diseases caused by a mental stimulus

-Diseases in which psychological trauma is an important but not the only factor

- Diseases in which the disease process already exists and the psychological factor aggravates it

Note that the disease of obesity can be assigned to each of the above-mentioned points in the classification. That is why it is so important and complicated to link the title disorder with human psychology.

### **Obesity and stress**

According to the definition, stress is a state of "increased nervous tension or mobilization of the body's forces in response to physical and mental stressors" (Kucharska, Grigo-Skrzypek, Bonder, Danielak, Kostecka 2018 p. 2). The main components of stress are stressors and the stress response. We can call stressors events or situations that lead to a disturbance of mental or physical homeostasis of a given person. Then there is the stress response, i.e. activities that a person performs as a result of neuronal and endocrine adaptations (Kelly, Hertzman, Daniels, 1997 p. 440). There are two types of stress, the first one - acute, which is sudden and activates the autonomic nervous system by releasing norepinephrine and epinephrine - in this case energy reserves are not exhausted. The second type is chronic stress. Prolonged susceptibility to stress causes excessive secretion of cortisol. It is a hormone belonging to glucocorticosteroids, it affects the increased level of lipid deposition, and thus the increase in appetite (Kozłowska, Śnieżek, Winiarska-Mieczan, Rusinek-Prystupa, Kwiecień, 2017, p. 58). Chronic psychological or biological stressors that threaten homeostatic equilibrium cause an overload state that promotes stability through change - allostasis. Allostatic load represents a set of processes that enable an organized and sustained adaptive response of an organism subjected to stress. In this context, exposure of the body to response mediators (neuroendocrine or immune) can be worrying and promote the development of various diseases (Ouakinin, Barreira, Gois 2018). The reaction to stress is followed by the "exhaustion phase" (Kucharska, Grigo-Skrzypek, Bonder, Danielak, Kostecka 2018). Excessive sympathetic activity can lead to hypertensive situations, while increased parasympathetic activity can lead to hypotensive situations, thus angiokinetic phenomena such as headaches and migraine can arise. In addition, corticotropin-releasing hormone, which is involved in acute stress, can induce mast cell degranulation, thereby triggering asthma, shortness of breath. Acute stress can also lead to various types of pain, hand tremors, gastrointestinal symptoms, and mental disorders such as panic attacks and psychosis (Valk, Savas, Rossum 2018 p. 194).

Food is a readily available resource and is often associated with something positive. No wonder that many people under the influence of negative emotions reach for high-calorie snacks to reduce stressful situations (Lech, Ostrowska 2018 p. 68). This behavior works and helps, unfortunately for a short period and does not get rid of the cause, so people start to become addicted to this method and reach for it more and more often. The lack of learning how to react to stress can come from childhood. A person who learned to take comfort from food when they were young, e.g. when parents interpreted a child's cry as hunger, will repeat this mechanism later in difficult situations in which they cannot count on the support of third parties (Jasik 2017 p. 124, 128). Research by Stalder et al. found evidence of a relationship between an increase in blood cortisol and an increased BMI (9.8% increase in blood cortisol for every 2.5 points of BMI) (Valk, Savas, Rossum 2018 p. 196). This means that obese people are more sensitive to stress than people of normal weight, and therefore more susceptible to depression or anxiety disorders.

Over the past year, living in a pandemic has meant that an even greater percentage of the population has to face stress, which also resulted in an increase in obesity. Self-isolation, a change in routine activities, fear and anxiety during the coronavirus pandemic have further aggravated the problem that has been growing for years (Washington, Earles, Gonsahn-Bollie 2021 p. 54). In addition, obese people are more likely to get sick with SARS-COV-2, because obesity is associated with chronic inflammation, reduced immunity, so it clearly increases the body's susceptibility to infections. The conclusions of the research conducted by Simonnet et al. proved that there is a relationship between obesity and a more severe course of COVID-19 (Tamara, Tahapary 2020 p. 658).

The factor that increases the level of stress and at the same time the formation of obesity is work, mainly in the case of overwork or night shifts. Women reacted much more often to work-related stress, who more often than men reach for sweet snacks to soothe their emotions. Men, on the other hand, choose to eat fatty foods and drink alcohol. It has been observed that employees show an increased level of stress in the case of, for example, low level of social support, occupying a lower job position, high workload, fatigue, discrimination and conflicts. All these factors aggravate the disease even more, which causes additional stress (Olszanecka-Glinianowicz 2017, p.

66). Research conducted by K. Kozłowska et al. shows that, depending on gender, each of them copes with stress in a different way. Women have a greater appetite when feeling bored and sad, and men only in the former case. The way to reduce stress also differs, women prefer to reach for something to eat, and men prefer to consume alcohol. Interestingly, it has been shown that negative emotions such as anger and fear reduce the appetite of the subjects (Kozłowska, Śniezek, Winiarska-Mieczan, Rusinek-Prystupa, Kwiecień, 2017, p.60). People who are most vulnerable to this anomaly are people with a low self-awareness and avoid solving problems, unable to cope alone in stressful situations. The result is a slow departure from social life, closing in on oneself, lack of desire to do sports. The problem related to weight and, at the same time, self-acceptance and poor perception of one's appearance is becoming an increasing problem (Kucharska, Grigo-Skrzypek, Bonder, Danielak, Kostecka 2018 p. 2).

### **Obesity affecting self-esteem and acceptance**

Regardless of body weight, everyone perceives their body in their own terms. Whether the current shape is accepted depends on the character of the person, social and environmental factors and, increasingly, medical recommendations. Teenagers and children often see their bodies the way their parents or peers see them. It often consists in comparing oneself [Jasik, 2017, p. 117]. Research by A. Myers and J.C. Rosen confirm that the stigmatization of people with excessive body weight is a common phenomenon, which results in greater psychological suffering, increased attention to their appearance and greater susceptibility to stress, resulting in worse coping with losing weight. Overweight people report discrimination at work, social exclusion, problems with clothing choices, stigmatization by the media and the diet industry, and public ridicule. A survey of 445 members of the National Association to Advance Fat Acceptance (NAAFA) found that 98% of them reported verbal harassment, criticism or teasing from family and friends [Myers, Rosen 1999 p. 222]. All these factors cause the creation of low self-esteem, focusing on one's appearance instead of professional and life achievements.

Subsequent overeating causes a sense of shame and intensifies negative emotions, causing states of resignation. In the worst case, it may even lead to depression, self-mutilation and suicide attempts (Kucharska, Grigo-Skrzypek, Bonder, Danielak, Kostecka 2018 p. 3). According to Mariusz Surowiec, "In psychological terms, the image is a reflection in the recipient's consciousness of the elements of reality noticed by him, it is not static, but is subject to constant reproduction, and is susceptible to external influences shaping it." (Raw material 2018 p. 75). The media creates new stereotypes about what each of us should look like. Perfect slim silhouettes and the formation of the ideal image of a "beautiful man" are still being advertised. Women are more susceptible to such manipulation. As a result, they believe that they are not satisfied with their appearance or body weight, despite the often correct BMI. Ames et al. additionally proved in their research that dissatisfaction with one's own appearance increases with age, and young girls in puberty are the most susceptible (Jednorą, Kosendiak, 2020, p. 49).

Young people's pursuit of a perfect figure is associated with the use of more and more rigorous diets. Unfortunately, despite the efforts, it does not bring the desired results, which introduces unconscious teenagers into many harmful psychological (stress, anorexia nervosa) and physical complications. It has been proven that the use of diets at a young age causes a higher probability of obesity or overweight in the following years of life than in people who do not use such methods. "Neumark-Sztainer et al. conducted observations which showed that after 5 years of restrictive diets, teenagers were 3 times more likely to be obese than people who did not undertake such rigorous practices." (Wojtyła-Buciora, Klimberg, Wojtyła, 2018, p. 152). All the factors mentioned above contribute to the expansion of the stereotype that an obese person is inferior, unable to take care of himself, lazy or simply unattractive. This causes worse and worse well-being in such people, increasing stress and finally eating it. Long-term mental discomfort may contribute to the development of other diseases, e.g. depression (Lech, Ostrowska, 2017, p. 66).

### **Obesity and depression**

Depression is a common mental disorder. Worldwide, more than 264 million people suffer from it, and it affects people of all ages. In the worst case, depression can lead to suicide attempts. Data shows that approximately 800,000 people die from suicide each year, making it the second leading cause of death among people between 15 and 29 (WHO 2021). It is a mental disorder from the group of affective disorders and leads to long-term depression of mood. However, this word is often overused in colloquial language, e.g. when describing the weather or a bad day, which causes trivialization of this disease, and people who really need help do not come forward out of shame in front of malicious comments from other people. Characteristic symptoms, apart from the feeling of depression, emptiness and depressed mood, can also be increased irritability and they lose interest in their current hobbies and even combine negative emotions with things that gave them pleasure (Hammen Constance 2004 p.14).

Diagnosis of people suffering from a somatic disease in order to diagnose depression is a major difficulty. This is because in this case, the emotional state caused by the disease and coping with it should be differentiated from looking for unusual symptoms that may characterize depressive states. However, it is not easy, because the symptoms of somatic disease are often more severe and mask any psychological symptoms, so it is important to pay special attention to such patients (Dudek, Siwek 2007 p.19). Research conducted by Małgorzata Obara-Gołębiowska proves that there is a relationship between increased levels of anxiety and depression in people with increased body weight. The previous authors of these studies confirmed that both disorders show similarity in pathogenesis in their development, i.e. disorders in the hypothalamic-pituitary-adrenal axis, conduction systems; serotonergic, noradrenergic and dopaminergic, which have been described above. This is shown by the data that as many as 32% of people treated for obesity suffer from depression at the same time (Obara-Gołębiowska, Pietrzykowska, Molisz, Nowicka-Sauer, 2017, p. 191, 194).

An additional problem is that one condition can cause another and vice versa. Although the risk factors for each of these diseases are mainly genetic and environmental, when one of the disorders is present, the chance of developing the other is 1.5 to 2 times higher than in the absence of it (Marmorstein, Iacono, 2017, p. 862). This has serious consequences, because patients who struggle with psychosomatic diseases, not only obesity, but also ischemic heart disease, diabetes, Parkinson's disease, pain syndromes, etc., respond much worse to antidepressant treatment, and depression itself may become chronic than in somatically healthy people. In addition, it also increases the risk of mortality (Dudek, Siwek 2007 p.18).

Looking at the mechanism of linking obesity with the incidence of depression, one can describe the chemical and biological processes that take place in our body. The increase in adipose tissue causes an increase in the number of adipocytes. Adipocytes secrete specific proteins, i.e. adipokines, which have pro-inflammatory or anti-inflammatory effects. They include e.g. leptin, resistin or adiponectin, which regulate the hunger and satiety center located in the hypothalamus. Resistin increases the secretion of IL-1, IL-6 and TNF- $\alpha$  from macrophages and at the same time elevates their levels through the action of the same cytokines, thereby causing inflammation. In obese people, adiponectin, which plays an anti-inflammatory role, is reduced, which results in a decrease in the Th1 response, polarization of pro-inflammatory M1 macrophages to the anti-inflammatory M2 type, production of IL-6 and TNF- $\alpha$ , and an increase in the secretion of the cytokine IL-10. Obesity therefore induces hypoxia and an inflammatory response. Then, there is a transition to the CNS and activation of microglia with cytokines IL-6, TNF- $\alpha$ . Pro-inflammatory cytokines can activate indoleamine 2,3-dioxygenase and induce neuroinflammation through the synthesis of neurotoxic tryptophan catabolites including kynurenine, 3-hydroxykynurenine and quinolinic acid. It has been suggested that depression is related to the effects of these neurotoxic products on the brain, in addition to the depletion of serotonin resulting from increased tryptophan catabolism related to indoleamine 2,3-dioxygenase function (Ouaknin, Barreira, & Gois 2018). Peripheral markers of inflammation are elevated in depression in late life, and their level is associated with the severity of depression. A meta-analysis showed that peripheral levels of IL-6, TNF- $\alpha$ , IL-10, IL-2, CCL-2, IL-13, IL-18, IL-12 IL-1 receptor antagonist and soluble TNF receptor 2 are related to the severity of depression and were elevated in people with depression compared to controls. Additionally, elevated IL-6 levels are associated with an increased risk of suicide. Antidepressant treatment significantly reduced peripheral concentrations of IL-6, TNF- $\alpha$ , IL-10 and CCL-2 (Alexopoulos, 2019, p. 7).

At the same time, obesity and depression are associated with changes in appetite, disturbances in eating behavior, and varying the importance of physical activity in the patient. Most often, these are an increase in appetite and a decrease in physical activity, but it happens that it is completely the opposite. It should be borne in mind that the combination of both diseases is associated with increased mortality, many complications and treatment failures. Therefore, it is worth remembering that in addition to treating the disease of an obese person, the mental health of the patient should be taken into account and appropriate therapies should be used, while observing the effects of drugs affecting body weight and emotional state (Olszanecka-Glinianowicz 2008, p. 82).

### **Childhood obesity**

The problem of obesity is increasingly affecting children and adolescents. It is true that the data on the number of patients varies depending on age and gender, but "the results of a nationwide study conducted by the team of the Institute of Mother and Child in 2016 indicate that the problem of excess body weight affects almost 1/3 of Polish 8-year-olds" (Pietrzak 2020, p. 25 after Fijałkowska, Oblacińska, Stalmach 2017). In this group of subjects, excess weight is not calculated using WHR or BMI, but using percentile charts. And so, a BMI above the 85th percentile will mean overweight, and above the 95th percentile - obese. In addition, excessive body weight is considered when "body weight exceeds by 20% the weight due to height" (Jasik, 2017, p. 119).

Obesity in children can be caused by hormonal, genetic and psychosocial factors, but also by poor food selection by parents. A child learns by imitation, so if parents cannot cope with excess weight, it increases the risk that the child will also struggle with the same problem. For example, parents may model depressive cognitive styles, unhealthy eating habits, and may also directly contribute to the risk of obesity co-morbidity by providing unhealthy food as a cure for "feeling bad." Obese parents may also model low self-esteem (in themselves or by criticizing their obese children), which may contribute to the occurrence of depressive symptoms in their offspring. In addition, common biological factors such as dysfunction of the stress response system or chronic inflammation may contribute to this form of comorbidity in families (Marmostein & Iacono, 2017, p. 2).

As with adults, obesity is associated with a large number of complications in younger people. One of them is the acceleration of the rate of development, maturation and growth, because a large part of the hormones responsible for this is secreted depending on the adipose tissue, e.g. steroid hormones, which are secreted from cholesterol. In addition, increased body weight in children increases the risk of obesity in adulthood, as well as the struggle with many diseases, for example atherosclerosis, diabetes, fertility problems in girls, coronary heart diseases, chronic fatigue. Psychological factors are also important. Obese people are more sensitive to stress, so if, for example, a child experiences discrimination at school and is ridiculed because of his appearance, it may lead to their self-isolation, isolation and, as a consequence, deepening the disease (Duda, 2017, p. 77). Unfortunately, teachers also contribute to maintaining stereotypes associated with obesity. Referring to Neumark-Sztainer's research, we see that out of 115 teachers surveyed, as many as 20% had lower expectations towards overweight students, thinking that they are more emotional, less successful and less motivated and strong-willed (Obara-Gołębiowska, 2020, p. 70). Therefore, before starting treatment, the cause of excessive body weight in a child should be well investigated and whether it is not related to psychological factors. "Working with an obese child should include teaching him self-control, controlling his appetite and motivating the child in times of mental breakdown" (Pietrzak, 2020, p. 32, after Jarosz 2010).

An important risk factor that is also worth mentioning is attention deficit hyperactivity disorder (ADHD). It occurs in about 5% of children and is one of the most common mental disorders. Studies show that approximately 85% of adults with ADHD suffer from at least one co-occurring psychiatric disorder, most commonly mood disorders, anxiety disorders, drug side effects disorders, personality disorders, which contribute to depression in adulthood. In addition, the prevalence of obesity, which is about 40% higher in children and adolescents with ADHD compared to those without ADHD, increases in adulthood (about 70% higher in adults with ADHD compared to those without ADHD). Therefore, effective methods of treating disorders co-occurring with ADHD, especially depression and obesity, are urgently needed (Mayer, 2018, p. 2).

All the examples described above are intended to show how important preventive health care is and the introduction of healthy eating habits by the child's relatives. More and more countries, including Poland, are imposing a tax on the sugar content of drinks in order to limit their consumption, in school shops sweets and crisps have been replaced with sandwiches and fruit. In order not to expose young people to harmful exposure, a ban on advertising spots with unhealthy food was passed between programs for children. (Zatońska, Basiak-Rasała, Połtyn-Zaradna, 2020, pp. 44-46).

## **Summary**

Increasing awareness about food will help in the fight against the epidemic of this disease. However, we must remember that a lot also depends on ourselves. Prevention of fighting obesity will not only help people cope with this disease, but also understand the reasons for its formation and development in adults and children. An increasing cause of morbidity are psychological disorders, stress and not coping with it. Anxiety, depression and long-term susceptibility to stress factors cause many biological mechanisms that contribute to the development of obesity. Excessive body weight can be the result as well as the cause of low self-esteem and lack of acceptance of your appearance. Sick people are often judged through the prism of prejudices and stereotypes, stigmatized, ridiculed and treated worse not only by people in their environment, but also by their families. Obese adolescents are even more susceptible to this, due to their natural sensitivity during both childhood and adolescence. Parents often influence their weight, and not themselves, so it is worth cultivating healthy habits and directly influencing the promotion of a positive food culture. You should also pay special attention to what we eat and how our body reacts to a given food, because our physical and mental health, as well as temporary well-being and general comfort of life, depend on its quality, content of macro- and micronutrients and the degree of processing. It is important to learn self-control and strong will, and not be afraid to seek professional psychological or dietary help.

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