

FOOD ADDICTION-DIAGNOSIS AND TREATMENT

Ivan Dimitrijević¹, Nada Popović³, Vera Sabljak³, Vesna Škodrić-Trifunović^{1,4} & Nina Dimitrijević²

¹University of Belgrade, School of Medicine, Clinic for Psychiatry, Clinical Center of Serbia, Belgrade, Serbia

²Health Center Zemun, Zemun, Serbia

³Center for Anaesthesiology and Reanimatology Clinical Center of Serbia, Belgrade, Serbia

⁴Clinic for Pulmonary Diseases, Clinical Center of Serbia, Belgrade, Serbia

received: 18.8.2014;

revised: 17.11.2014;

accepted: 16.12.2014

SUMMARY

In this article we summarized the recent research of the food addiction, diagnosis, treatment and prevention, which is carried out in this area. The concept of food addiction is new and complex, but proven to be very important for understanding and solving the problem of obesity. First part of this paper emphasizes the neurological studies, whose results indicate the similarity of brain processes that are being activated during drug abuse and during eating certain types of food. In this context, different authors speak of "hyper-palatable", industrial food, saturated with salt, fat and sugar, which favor an addiction. In the section on diagnostic and instruments constructed for assessing the degree of dependence, main diagnostic tool is standardized Yale Food Addiction Scale constructed by Ashley Gearhardt, and her associates. Since 2009, when it was first published, this scale is used in almost all researches in this area and has been translated into several languages. Finally, distinguish between prevention and treatment of food addiction was made. Given that there were similarities with other forms of addictive behavior, the researchers recommend the application of traditional addiction treatment.

Key words: obesity - food addiction - Yale food addiction scale

* * * * *

INTRODUCTION

Addiction diseases are most common modern diseases. They, directly or indirectly, affect all phases of the life cycle of the individual and the family, preventing human functioning in the areas of personal, family, professional and social. Numerous studies point out their wide distribution in the general population, which in some areas has epidemic proportions. Alcoholism and smoking are the oldest forms of substance abuse. Smoking is linked to many serious diseases that often leads to death, and alcoholism is the third most frequent, right after cardiovascular disease and cancer. Drug abuse, particularly combined use of substances, is a growing problem, especially among the young. The modern age has brought new vices like internet addiction and pathological gambling, which are also commonly encountered in the younger population. (Dimitrijevic 2004).

In addition to this, article considers some other aspects of addiction, which are subtle and, hence, difficult to notice. This article deals with the problem of obesity, which is, according to the new scientific research, associated with addictive behavior, and very often in the literature instead of "overweight" meets the term "food addiction".

EPIDEMIOLOGY OF OBESITY

Obesity is a global health problem that requires a multidisciplinary treatment including specialists in mental health, medicine and surgery. It leads to a significant increase in morbidity and mortality and consequently

reducing quality of life. It is estimated with body mass index (BMI) and obesity among adults is defined as $BMI \geq 30$. The prevalence rate of obesity starts to rise at early '80s, and at 1997. The World Health Organization (WHO) considered obesity as a major social and health problem. Until 2005, 23.2% of the world's adult population was at lower limit of obesity ($BMI = 25$ to 29.9), and 9.8% obese ($BMI \geq 30$). WHO estimates that in 2030, the 57.8% of the world population will be obese or at lower limit (Avena et al. 2011). Statistical data indicates that obesity is the second cause of death in America (according to statistics of the National Institutes of Health nearly 35 million Americans are obese), which points out the possibility that, because of this problem, the current generation of children will be the first generation that will have shorter life than their parents (Kayloe 1993). Obesity has assumed epidemic proportions, both in the world and in our country. In fact, the survey results show that more than half of the adult population in Serbia has a problem with excessive nutritional status, with 36.7% of adults is at lower limit of obesity, while 17.3% are obese. The consequences of obesity are multiple and include metabolic and endocrine complications, disruption of the hormone level, and circulating factors, organ systems diseases, malignancy diseases, mechanical complications, surgical complications, and psychosocial problems (Ivkovic 1992). The problem of obesity is most often viewed from a medical aspect and is associated with genetic predisposition, malfunctioning endocrine-metabolic systems, psychological variables and external determinants. Keeping this fact in mind, we see that this is not a single disease but a syndrome, a common clinical manifesta-

tion of a number of pathological, physiological and psychological events. Despite the wealth of expertise and many researches “effective medicine” was not found, and some of the most successful behavioral diet programs exhibit relapse of 56% of the participants (Kayloe 1993). In order to improve the prevention and more successful treatments, scientists are considering the impact of new factors that could be causing the high rates of obesity. In this context, more and more begin to talk about the kind of food that is addictive and activates brain processes similar to those that occur with drug or alcohol.

MECHANISM OF FOOD DEPENDENCE AND SIMILARITIES WITH OTHER FORMS OF ADDICTION

In recent decades, food and dietary patterns of behavior have been radically changed. Earlier, the man ate only enough to get the necessary energy for life, and now it brings a much larger amount than is required for other reasons. The question is what is causing it and what effect these changes may have. Development of the food industry allowed creation and modification of food, leading to its increased “rewarding properties” (its palatability) in order to enhance sale. In addition, this food is rich in calories, saturated with fat, sugar, additives, have low nutritional value, easily accessible and there is abundant. In an attempt to explain the strong motivation in situations compulsive overeating, researchers say that it is this type of food (sweet, salty, oily) which has the potential to be addictive. Randolph (1956) talks about the food people are extremely sensitive to, and in that group he puts corn, coffee, milk, eggs and potatoes. Avena et al. (2008) speak of addictive food that is saturated with sugar and high-calories. Cocores and Gold (2009) includes food rich in salt and additives in this type of food, and Gerhardt et al. (2011) assigns common name “hyper-palatable food”, (food that is addictive) to this kind of food (Meule 2010). In addition to having properties of hedonistic, “addictive food” can develop behavioral strategies to eliminate negative mindset, but it should be noted that such behaviour could be driven by variety of factors (Szczeplniak et al. 2011). One group of authors describes food addiction as an extreme preoccupation with food and eating periodically vast quantities in a short period of time. These episodes can occur from once a day to once every few weeks, after which a person feels guilt, shame, depression, and the trigger for such “overeating” behavior is emotional stress. In such situations, compulsive eating patterns can be seen as a result of ineffective self-control scheme (Kayloe 1993). Levitan and Davis (2010) have similar views, they talk about “emotional overeating”, i.e., food consumption in order to modify the negative sentiment caused by depression or stress (Dębska et al., 2011, Mazur et al 2011). They believe that the role of food in this case is exactly the same as role in drug addicts (Levitan & Davis 2010).

New scientific research suggests the existence of many similarities between people who show signs of food addiction and people who are diagnosed as addicted to substances. Joseph Frascella, director of neuroclinical science and behavioral research, the National Institute on Drug Abuse (NIDA), along with colleagues, examined the overlap of obesity and addiction. In his research he noted that people who are dependent on food describe processes that happen to them the same as drug addicts or alcoholics do. They talk about the desire for food, the withdrawal symptoms and escalating patterns of eating that may indicate tolerance (DiLeone et al. 2011). The researchers also point out similarities between brain processes that occur during the use of both drugs, and through the consumption of food which emphasize the role of dopamine, a neurotransmitter that is part of the motivation and reward systems of the brain. Sketch of the brain (obtained from positron emission tomography scan) shows that the special fields of mesolimbic reward systems, such as the caudal nucleus, hippocampus and insula are activated by food. Both of these substances release striatal dopamine (a neurotransmitter that is part of the reward system). Next to him, the use of drugs or food (sweet, salty, fatty), activates endogenous opiates (another group of participants in the ways of rewarding), and opioid blocker (naltrexone) shows a reduction of desire for both. In addition to the above similarity is the fact that the compounds that act as inverse agonists in the endocannabinoid system used in the treatment of substance dependence and promote weight loss (Colantuoni et al. 2011, Gearhard et al. 2009). Further research has used functional magnetic resonance imaging (fMRI) which makes it possible to measure the metabolic changes that occur during the activation of certain parts of the brain. Gearhardt et al. (2011) in a sample of 48 women measured brain activity while they were drinking a chocolate milkshake, and when pictures of milkshake cups filled with water were shown to them. When women look at a picture of milkshake activities increases in the areas of the brain that encode motivational value of certain stimuli in response to food signals. Activities in these areas are associated with craving for food. Women with higher food addiction scores had higher activity in areas of the brain involved in decision-making and behavior control, as well as creating a relationship between stimulus and response. In case they were drinking a milkshake, with women more dependent they had less activation in areas of the brain that is responsible to inhibit certain behaviors, which suggests that these women are less able to control their behavior (Gearhardt et al. 2009). In addition, studies have shown that such behaviour is frequently related to self-discrepancies as well as negative body-related attitudes, in women (Brytek-Matera 2011). A survey conducted by Gearhardt and her associates showed that food addiction (in this case taken highly caloric and sweet drink as a representative) correlated with greater activation in the anterior cingulate cortex, medial orbitofrontal cortex and amygdala in response to the anticipation of eating. In addition, the participants with higher food addiction

scores have recorded dorsolaterally greater activation in the prefrontal cortex and caudate nucleus, and less activation in the lateral orbitofrontal cortex, which is recorded as a response to the consumption of food. These findings confirm the hypothesis of similarity in brain processes that occur in drug addicts and food addicts (Gearhardt et al. 2009, Fortuna 2012).

DIAGNOSIS OF FOOD ADDICTION

Empirical studies of food addiction are relatively new because they lacked psychometrically valid instruments, until recent. Cassin and Ranson (2007) used a structured clinical interview based on the criteria of addiction in the DSM IV, and later developed an interview-based on Gudmans criteria for addictive disorders. Merlo et al. (2009) in order to explore the concept of "food addiction" used the Eating Behaviors Questionnaire (EBQ), which contains 20 items that are answered by circling the answer to six-degree scale and scored in similar way ("never-1", "always-6"). Issues include the three criteria of addiction: compulsive use of food over time, attempts to reduce the amount of food and continued use despite adverse consequences. This questionnaire contains a direct question: "Do you think you are addicted to food?". Using parallel forms for children and adults, Merlo et al. found that 15.2% of children who answered on claims circling the appropriate answer "often", "usually", "always", considered themselves food addicts. They also found a positive correlation between the score on the EBQ and BMI (Meule 2010).

The most commonly used scale today is standardized Yale Food Addiction Scale (YFAS), which is also a promising tool for obtaining new insights into the whole construct of food addiction. It was constructed in 2008 by Ashley Gearhardt and associates in an attempt to identify those who show signs of dependence on certain types of food (food saturated with sugar, fat or salt). It has shown good internal reliability, good convergent validity with measures obtained from similar constructs, as well as good discriminant validity in relation to measures that have been obtained from tests related but different topics (Liebman 2012). Since 2009, when published, this scale was used in almost all research related to the concept of food addiction and has been translated into several languages. It is an instrument for the identification of problem behaviors in feeding behavior similar to that encountered in other forms of addiction (Meule 2010). Yale food addiction scale contains 25 items covering different response categories (dichotomous and Likert-type format) and two items which inform us about the kind of food that the subject would have a problem. All items can be correlated with the criteria of substance dependence as defined in DSM-IV. Different set of items is an indicator of certain criteria, and the presence of three or more criteria indicates a dependency (Gearhardt et al. 2009b).

YALE FOOD ADDICTION SCALE

This research examines your eating habits over the past year. Sometimes people have control problem taking

of certain types of food such as: sweets (ice cream, chocolate, candy, cookies, cakes), white bread, biscuits, pasta, rice, also salty snacks, chips, pretzels, crackers and sweetened beverages such as soft drinks.

When the following questions asks about "CERTAIN FOOD", please think of ANY food similar to those listed in the food group or ANY OTHER food you have had a problem with in the past year.

Gearhardt et al. (2009) in their research on a sample of 353 participants, using YFAS, diagnosed 11.4% of normal-weight people food addiction, and to similar data came Meule et al. in their study in Germany (using the German version YFAS). Although there was little correlation between food addiction and BMI (body mass index) diagnose of food addiction was more common in obese persons. This finding was confirmed by examining the participants which were prepared for bariatric surgery where BMI, with 40% of participants who had been diagnosed as addicted to food, BMI did not differ from those who are not. This suggests that some people become obese for other reasons, not because of food addiction (Meule 2010).

SYMPTOMS OF FOOD ADDICTION AMONG THE CHILDREN AND ADULTS

More recent, a qualitative study conducted by Pretlow (2011) indicates the frequency of the following three symptoms in children:

- Consuming a large amounts of food over a long period of time;
- Unsuccessful attempts to stop or reduce the amount of food intake;
- Continuing consumption despite harmful consequences.

In the same study, 77% of children said that eating more now than before and when they were asked why 15% said that they were now less satisfied by food. When they were given a definition of addiction 29% said they see themselves as addicts (Meule 2010).

Gearhardt et al. (2011) in their research, using YFSA, reveals that the most common symptoms of food addiction with adults are:

- Persistent desire or repeated failures to reduce the amount of food intake;
- Continued consumption, despite harmful consequences of food;
- A lot of time spent in trying to reduce the amount of food consumed, as well as a lot of time spent on recovery from overeating.

According to the latest study, these symptoms were present in obese people who overeates themselves (Meule 2010).

FOOD ADDICTION AND OVEREATING DISORDER

Besides the obtained significant positive correlation between food addiction and obesity, many studies have

observed a link between food addiction and overeating disorders. In interview based on an estimation of Kassir and von Ranson (2007), 92% of those who have a disorder of overeating can be classified as addicted to food when modified criteria of the DSM-IV is used. After applying modified Gudmans criteria for addictive disorders 40.5% received a diagnosis of food addiction. Using YFSA 56.8% of participants were classified as addicted to food in a sample of obese patients with overeating disorder. Similarly, 72.2% of obese participants which were identified by YFSA scale of food addiction, are diagnosed with a disorder of overeating and that confirms association between these two constructs (Levitan & Davis 2010).

DIAGNOSTIC CRITERIA FOR FOOD ADDICTION

In DSM-IV substance addiction is defined as a cluster of cognitive, behavioral and psychological symptoms associated with continuous use of substance despite significant problems caused by that substance. To diagnose food addiction, as well as any other addiction, it is necessary to establish the existence of at least three of the following symptoms (Avena & Gold 2011).

Tolerance

Research with laboratory rats goes in favor of tolerance existence. However, there is little research on adult food addiction, mainly because of methodological difficulties (Avena et al. 2011). In contrast to substances such as alcohol or nicotine where consumption start refers to the period of adolescence, the use highly fatty or sugary food begins in infancy. Thus, young children are not subject to testing. Harrison suggests that sugar can be an effective analgesic for very young children, but these effects disappear after the age of 18 months when many children have already begun to regularly consume food rich in sugar. Research relating to tolerance must start at the time, in order to obtain more precise results. In the adult population there are studies that indicate tolerance; however studies at an early age would be more informative. Braun et al. found that, as the disease progresses, overeaters eat more often and in large quantities. They spend more time eating and they have less control over that behavior. It is necessary to further investigate what kind of food can develop tolerance. If it develops while eating food like vegetables and fruits, it can be argued that these effects are not related to the addictive process. Also, it is necessary to examine whether the reduction of food over time serves as a motivation for the consumption of this food.

Abstinence symptoms

Animal studies suggest that abstinence symptoms may occur if the animal is disabled of proper input of the desired food. In controlled laboratory conditions,

rats were exposed to hyper-palatable food (sugar) and as long as it was available they were "overeating" and eventually developed a tolerance for that kind of food. In cases where the food input was limited, they showed similar signs of abstinence symptoms (tremors, fever and aggression). In addition, the rats showed signs of craving for substances that have a similar effect (amphetamines) (Avena et al. 2011). In humans there is not enough evidence (mostly statements about how they feel over adherence to diet - tremors, chills, sweating, etc.). More detailed investigation of this criterion is needed.

Loss of control

This symptom is common with overeating disorder (BED) and bulimia nervosa (BD) (Juli 2012). They eat faster than others, and eat when they are not hungry, until they become ill, eat alone, and after overeating there is a sense of shame, disgust, depression, guilt. The trigger is the consumption of food rich in sugar and fat. 1-4% of the population belongs to this group of people. Episodes of uncontrolled eating can also be seen in non-clinical population. 9% of people with normal weight and 21% medium obese show signs of mild occasional overeating. The existence of this symptom is documented in this population. Although concerned about their weight, they do not control their eating. A factor that contributes to overeating is also pervasive marketing.

The desire or repeated unsuccessful attempts to stop consumption

The importance of this symptom can be recognized by acknowledging the fact that the annual consumption of 33 billion dollars is spent on diet products and weight loss programs alone. There are evidences that the desire to reduce food consumption occurs in 37% of children who attend primary school. Repeated failures were recorded in 83% of participants in different dietary treatments. This criterion is very commonly found.

A lot of time spent in refraining from eating or in the recovery of consumption

"Hyper-palatable" food is highly caloric, but has a low nutritional value, because it is cheap and available in large quantities (this criterion is questionable because the use of food is legal and available). There is no empirical data, only statements of patients which are struggling and refrain from consumption during the dietary program.

Waiver of other important activities

There is evidence that suggests that the participants rather choose unhealthy than healthy food, and that they would rather eat than take part in other activities that satisfies them. When their desire for food consumption grows, they can reduce all the other activities that make them happy in order to purchase and consume certain food.

Continued use despite physical and psychological problems

Studies on animals (laboratory rats), which were exposed hyper-palatable food rich in sugar shows that, despite the received electric shocks, the rats continued to consume continuously (Taylor et al. 2010).

Studies conducted on humans give similar results. It has been observed that people keep eating certain types of food, although it has negative consequences. In the context of clinical research and health care for heart disease, patients are told that they must not eat chocolate, or they will be excluded from the program. 139 out of 1200 of them were excluded due to consumption of chocolate. This data supports the existence of this criterion.

Addiction potential of food has been discussed for decades. Novelty in food addiction diagnostic criteria have appeared in the DSM-V, where criteria for substance abuse and-dependence were merged, in 2013. Although there are a lot of studies that discuss the applicability of the DSM-IV substance dependence criteria to eating behavior, the transferability of the newly added criteria to eating in DSM-V is unknown and is yet to be established (Meule & Gearhardt 2014).

The diagnostic threshold and clinical significance of distress

In order to diagnose substance dependence it is necessary to establish the existence of at least three of the listed symptoms and clinically significant impairment or distress. Although the research does not evaluate the level of distress or discomfort some indications were recorded. Schwartz et al (2006) in a sample of 4283 people found that 46% of them would waive 1 year of their life rather than be fat, 15% would waive 10 years, 25% would agree to have no children, 30% would rather be divorced than obese and 14% overweight rather be alcoholics (Avena & Gold 2010).

Previous studies show that the most common symptoms of food addiction are: eating large amounts of food over a long period, an attempt to reduce food consumption and continued use despite consequences. Rare symptoms of these are: tolerance and time spent on the purchase and consumption of food, while the rarest occurring symptoms are withdrawal and reduction of social, occupational or recreational activities (Meule 2010).

PREVENTION AND TREATMENT OF FOOD ADDICTION

Obesity is accompanied by significant psychological, social and economic consequences. Huge sums of money are invested annually in treatment programs as an incentive to new research on the etiology of the problem. Scientists, who have showed significant overlap between food addiction and other forms of addictive behavior, believe that traditional applicable

therapies in other areas of addiction can be applied to solve a weight problem (motivational talks, cognitive-behavioral therapy, problem-solving program 12-step, etc.). In order to improve the effect of treatment, experts in this field believe that it is useful to observe the following guidelines: (Gearhardt et al. 2011).

We should not starve!

Although drug therapy for alcohol and drug requires abstinence, in the case of food addiction this approach is impossible, one must eat to survive. In addition, scientists believe that hunger stimulates cravings and uncontrolled entry if in this case it's available. Avoid signals that may trigger increased desire for food! Gearhardt et al. believe that, for those who are addicted to food, attention to signals of food is essential. You need to pay attention to what it is that makes us lose control, if that's pizzeria or bakery on the way to work, change your route (Gearhardt et al. 2009a).

Eat only when you feel hungry!

One of the tools used by nutritionists is ten-degree hunger scale where 0 means starvation, and 10 overeating. In the treatment of food addiction goal is to stay out of the two extremes, eating when feeling hungry (2 to 3) and stop when you feel satiety (5 to 6).

Avoid stress, control emotions!

Some people under stress eat more than usual because food can reduce anxiety to a certain degree. Food should not be used as a tool for the recovery of emotional distress. It is necessary to find "healthier" strategy for tolerating feelings of sadness, anxiety, anger, etc.

Regular exercise!

Pleasure could not be found only in consuming chocolate, pizza, "big mc", but also in regular exercise. In studies using animals have shown that exercise increases the number of dopamine receptors in the brain.

Scientists also point out that recognition and personal responsibility for certain behaviors are essential components for successful treatment, but do not exclude the responsibility of the individual a food processing and marketing has. It allows the creation of unhealthy food (sweet, salty, fatty), which is high calorie, has low nutritional value, it's cheap, readily available and has the potential to be addictive. In order to stand up against obesity and to improve prevention, the potential use of public health policy is examined, and as an example is taken the public health interventions that have had the effect of reducing the use of addictive substances such as tobacco and alcohol. Research shows that, when the price increases, availability reduces, and marketing become negative and minimized, there is a reduction in use of these products and the improvement of public health. This strategy could also be applied in the prevention of dependence on certain food (Rogers 2011, Fortuna 2012).

In addition to encouraging prevention and testing the effects of different treatments, scientists are working to develop medications (testing new types of drugs that will help in the treatment of food addiction). New hopeful drug is ribonamant, whose impact is still being tested on animals. Beside him there are other drugs being made to solve the problem of obesity and addiction, and to affect the brain processes and reward system (Liebman 2012).

CONCLUSION

The concept of food addiction is complex, the delimitation of its defining characteristics requires considerable debate. Until recently, the rate of prevalence of food addiction was unreliable, many studies were descriptive, by direct questions it was assessed the frequency of this occurrence. Today, standardized YFAS (Yale food addiction scale) is a promising tool for obtaining new insights into the whole construct. Researches in this area that are primarily focused on understanding the obesity problems show that obesity and food addiction are not equivalent terms. This is supported by the fact that food addiction was seen in people with normal body weight, and even person with low BMI (more studies are necessary). It is noticed that food addiction could not absolutely explain the epidemiology of obesity, but it may be its cause and gaining insight into this fact significantly contributes to the treatment. Scientists suggest that testing food addiction should become a routine part of the obesity treatment (from different dietary programs to gastrointestinal surgery) in order to achieve long-term success and to prevent “the transfer of addiction” in cases of “abstinence” from certain food.

Acknowledgements: None.

Conflict of interest: None to declare.

References

1. Avena MN, Wang M et al: Implications of Food Addiction and Drug Use in Obesity. *Psychiatric Annals* 2011; 41:10, 416.
2. Avena NM & Gold MS: Food and addiction-sugars, fats and hedonic overeating. *Addiction* 2011; 106:1214-15.
3. Brytek-Matera A: Body attitudes and self-representation in women with eating disorders. Research based on Edward Tory Higgins' self-discrepancy theory. *Psychiatr Pol* 2011; 45:671-82.
4. Colantuoni C, Schwenker J, McCarthy J, Rada P, Landenheim B, Cadet JL et al: Excessive sugar intake alters bingeing to dopamine and mu-opioid receptors in the brain. *Neuroreport* 2001; 12:3549-3552.
5. Dębska E, Janas A, Bańczyk W & Janas-Kozik M: Depression or depressiveness in patients diagnosed with Anorexia Nervosa and Bulimia Nervosa - pilot research. *Psychiatr Danub* 2011; 23(Suppl 1):S87-90.
6. Dimitrijević I: Bolesti zavisnosti-dijagnostika, lečenje, prevencija. Beograd: KIZ "Centar", 2004.
7. Fortuna JL: The obesity epidemic and food addiction: Clinical similarities to drug dependence. *Journal of Psychoactive Drugs* 2012; 44:56-63.
8. Gearhardt AN, Corbin WR et al: Preliminary validation of the Yale Food Addiction Scale. *Appetite* 2009a; 52:430-436.
9. Gearhardt AN, Corbin WR et al: Food addiction: an examination of the diagnostic criteria for dependence. *Addiction* 2009b; 3:1-7.
10. Gearhardt AN, Yokum S, Orr PT, Stice E, Corbin WR & Brownell KD. Neural correlates of food addiction. *Arsch Gen Psychiatry*, 2011.
11. Gearhardt AN, DiLeone RJ et al: Can food be addictive? Public health and policy implications. *Addiction* 2011; 106:1208-12.
12. Ivković LT: Gojaznost. Beograd: Medicinska knjiga, 1992.
13. Juli MR: Analysis of multi-instrumental assessment of eating disorders: comparison between Anorexia and Bulimia. *Psychiatr Danub* 2012; 24(Suppl 1):S119-24.
14. Kayloe CJ: Food Addiction. *Academic Journal* 1993; 30:269-274.
15. Levitan DR & Davis C: Emotions and Eating Behavior: Implications for the Current Obesity Epidemic. *University of Toronto quarterley* 2010; 79:784-799.
16. Liebman B: Food & Addiction-Can some food hijack the brain? *Nutrition Action Healthletter* 2012; 30.
17. Mazur J, Dzielska A & Małkowska-Szkutnik A: Psychological determinants of selected eating behaviors in adolescents. *Med Wieku Rozwoj* 2011; 15:240-9.
18. Meule A: How prevalent is "food addiction"? *Frontiers in Psychiatric* 2010; 2:1-5.
19. Meule A & Gearhardt AN: Food Addiction in the Light of DSM-5. *Nutrients* 2014; 6:3653-3671.
20. Rogers PJ. Obesity-is food to blame? *Addiction* 2011; 106:1213-20.
21. Szczegieliński A, Pałka K, Krysta K & Krupka-Matuszczyk I: Eating disorders in Silesian schools - pilot study. *Psychiatr Danub* 2012; 24(Suppl 1):S135-9.
22. Taylor VH, Curtis CM et al: The obesity epidemic: the role of addiction. *Canadian Medical Association Journal (CMAJ)* 2010; 182.

Correspondence:

Professor Ivan Dimitrijević, MD, PhD, Neuropsychiatrist
Clinic for Psychiatry, Clinical Center of Serbia, University of Belgrade
Pasterova 2, 11000 Belgrade, Serbia
E-mail: dr.ivan54@yahoo.com