

## CENTER FOR THE PREVENTION AND TREATMENT OF OBESITY IN CHILDREN AND ADOLESCENTS

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*In response to the epidemic spread of obesity in children and adolescents, in Serbia in 2008 there was established a Centre for the Prevention and Treatment of Obesity in the Special Hospital "Čigota" and a multi-disciplinary health care program called Čigotica was developed. The program is a promotion of a healthy lifestyle and includes dietary interventions with a reduction in the total daily calorie intake, a planned physical activity, other therapeutic measures (medications), an educational and psychological support. Participation in the program Čigotica offers to adolescents a choice between a healthy and unhealthy way of life and helps to identify the key factors necessary for the long-term changes in behavior and adoption of healthy life habits. Short-term effects of the program Čigotica encourage and indicate that a multidisciplinary approach leads to a significant body mass reduction, improved blood pressure and metabolic risk factors, aerobic capacity and self-esteem in obese adolescents. A large number of adolescents have complications caused by obesity, and the prevalence of type 2 diabetes mellitus in the test group was 0.3%, which indicates that the problem of obesity is not recognized in time both by parents and medical employees and that there is a need for more efficient prevention programs. Efficiency of Čigotica program and of multidisciplinary treatment of obese adolescents will be evaluated by this current research that considers the sustainability of achieved results.*

Descriptors: OBESITY, ADOLESCENTS, BODY MASS INDEX, TYPE 2 DIABETES MELLITUS

### INTRODUCTION

Obesity is becoming a serious threat to public health. According to the data of the World Health Organization from 2011, 35% of adults were overweight and 11% were obese, which means that the world has 1.46 billion of pre-obese and 500 million obese adults (1). This indicates a double increase in the incidence of obesity in adults compared to 1980 and an increase in the mean value of body mass index (BMI) by 0.4-0.5 kg/m<sup>2</sup> for each decade in both men and women.

The largest number of overweight and obese people is in the U.S.A., where men are particularly at risk for the occurrence of obesity. It is estimated that in the United States of America even up to 50% of the population will be obese by 2030. Despite the alarming data, only one-third of obese patients is treated and has a suitable therapy (2).

Obesity as epidemic occurs at an earlier and earlier age. It is believed that over 10% of school age children are overweight and that even 110 million children can be regarded as overweight or obese (3). Worldwide, overweight in children grows faster than the obesity in adults. Only in the last six years, the prevalence of overweight in children worldwide has been growing by about 6% at almost all age groups. The increase in the incidence of obesity in children and adolescents and the fact that obese children suffer from a gradually higher degree of obesity and that up to 85% of obese adolescents remain obese in adulthood, make these concerns justified (4).

According to the results of the Population Health Survey in Serbia in 2006, almost a fifth (18%) of children and adolescents aged 7-19 were overweight, out of whom 11.6% of the children were overweight and 6.4% were obese, which compared to the incidence in 2000 was an increase of nearly 50% (5).

Obesity is the most common chronic disease in children and adolescents. The rising trend in the prevalence of obesity in children leads to the increased risk of formation of associated endocrine, metabolic, cardiovascular, respiratory and other health disorders, a lower quality of life and reduced average life expectancy in the next generation of adults. In addition to numerous complications, obesity is a cause of great economic burden i.e. costs and it accounts for 7-12% of all the costs for health care in Western countries (6). Since the results of treatment are usually unsatisfactory, the importance of measures for the prevention of obesity in childhood and adolescence is increasing (1). In order to attempt the prevention and treatment of obesity in children and adolescents, over 100 different interventions respectively programs for

prevention and treatment of obesity have been developed and tested over the past two decades (7, 8). Surprisingly, a small number of obese children participate in the programs for the reduction of body mass, and long-term effects of these programs generally are not known (9).

In Serbia, obesity is becoming an increasingly important problem whose solution requires an urgent, comprehensive and long-term program of multidisciplinary measures and activities. In response to the epidemic spread of obesity in children and adolescents in our country, the Association of Serbian Pediatricians in cooperation with the Special Hospital "Čigota" which has a long experience in the treatment and rehabilitation of obesity in adults, developed the project "Prevention and treatment of obesity in children and adolescents in Serbia" in July 2007 (5). The Republic Institute for Health Insurance under the auspices of the Ministry of Health approved in the spring of 2008 the treatment and rehabilitation of the obese children aged from 12 to 18 for a period of 21 days once a year and the establishment of the Center for prevention, treatment and rehabilitation of overweight and obese children and adolescents within the Special hospital "Čigota". By the Decision of the Republic Institute for Health Insurance dated August 2013, the treatment of obese children in the Centre lasts for 14 days.

months professors - Ph.D. pediatricians-endocrinologists from Belgrade and Nis perform consultations and perform rounds at the Centre. Under the expert supervision, patients get a plan of diet and physical activities depending on age, fitness and health status, and if necessary, a medication therapy is introduced in the treatment. Hospitalization lasts for 14 days and is based on medical observation, monitoring and treatment of complications of obesity. The immediate goal of treatment is to achieve long-lasting reduction in body mass. The process is hard and it is evidenced by the fact that approximately 80% of children who achieved the adequate, desired reduction in body mass, after 9 years regained their body mass (10).

With a clinical examination at admission, patients are identified with primary and secondary obesity and present complications of obesity, diagnostic procedures are planned, diet and physical activities are planned individually for each obese child. Treatment according to the Čigotica program requires a multidisciplinary approach, team work with an individual approach and a program for treatment of each patient. The treatment in our Center consists of:

**Hypocaloric balanced diet**

The basic principles and the main form of obesity treatment in childhood and adolescence are comprised in the balanced hypocaloric diet. The total intake amount of calories is limited, but planned meals provide nutritive needs of an organism that is developing and growing (11). The restriction of calorie intake in children is individualized and carefully monitored so that the normal growth and development would not be compromised (6). The total daily quantity of food is divided into 5 meals (breakfast, lunch, dinner and 2 snacks). All the meals are prepared at the Special hospital "Čigota" under the surveillance of an experienced cook and a nutritionist. The meals are prepared according to the basic principles and instructions on the importance of a healthy diet in the prevention of obesity, and on the basis of initial daily calorie needs and physical activity of

**Physical activity**

The program Čigotica consists of six types of physical activities, lectures and targeted programs of social-entertainment activities. On the basis of the test of anaerobic abilities and health condition, program activities are planned. The planned physical activities are: Walking, fast walking in the countryside, along the trim path or using cardio fitness training simulators; shaping exercises, strengthening particular muscle groups with or without equipment (a therapeutic ball, elastic bands...), exercises in the water, trained swimming, field games, activities in the open and sports games. The physical activity is organized on the daily basis, it is versatile, entertaining and adjusted to obese children. The activities are graded from the first to the last day in terms of lengthening the path, increasing the speed of walking, changing terrain configuration. Physical activity, together with the hypocaloric diet, contributes to the body mass reduction, increases physical abilities and helps in maintaining the initially reduced body mass. Our goal is that children take part in the standard physical education curriculum upon returning home (12).

### Hypocaloric balanced diet

**Psychological support**

Obesity is not only a medical problem but also an important psychological problem so that the treatment process needs also to provide psychological assistance and support. The program of psychological preparation involves an interview with a psychologist, a questionnaire for self-evaluation and psychological assistance, 6 workshops and the support in understanding and dealing with the problem of obesity. It is shown that the therapeutic program involving a change of lifestyle gives much better

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results and that a long-term success can be achieved only with the change of lifestyle. That is why the successful and long-term effects of the therapy in children need the psychological approach directed towards a change of attitudes, beliefs and behavior related to diet and physical activity (13).

#### Education

The lectures and workshops of the pediatrician, nutritionist, psychologist and physical education teacher together with the exchange of experiences of obese children, contribute to the adoption of new knowledge and opinions in terms of importance of healthy diet, physical activity, reduced sedentary behavior and contributes to the improvement in interpersonal relationships and solving emotional problems in obese adolescents. Adopting knowledge about a healthy lifestyle increases motivation and cohesion of a group in order to solve the obesity problem together.

#### Corrective exercises

Under the supervision of a physical therapist, exercises are organized for children with deformities of the spine, and exercises for the prevention of irregular body posture are organized for the other children twice a week. At release, each child receives advice, instructions and recommendations (in oral or written form) for further monitoring by a competent pediatrician, psychologist and nutritionist.

#### OBJECTIVE

The goal of our study is to determine the short-term effects of multidisciplinary treatment of obese adolescents on the body composition and to estimate the incidence of diabetes mellitus type 2.

#### METHODOLOGY

The study realized in our Center included 980 children (523 girls and 457 boys) in the period from 2011 to 2012 with an average age of 15.65 with whom primary obesity was diagnosed. The study did not involve the children with

secondary obesity, unmotivated children and adolescents treated for less than 21 days. Body mass, BMI and % of fat were obtained by using a Tanita scales to determine a body composition (impedance method). The criterion for obesity is the body mass index  $\geq +2$  SD (according to current WHO recommendations). In addition to the planned biochemical analysis, the level of blood glucose before having any meal as a basal glucose concentration was determined during the oral glucose tolerance test.

#### RESULTS

After a multidisciplinary hospital treatment which also includes the education about lifestyle changes, hypocaloric balanced diet, regular physical activity, psychological, educational and clinical support, it came to a significant initial loss of body mass. The average loss of body mass in all adolescents is  $5.92 \pm 2.71$  kg. Average BMI decreased by  $2.12 \pm 0.31$  in all the tested patients, and BMI z-score decreased by  $0.26 \pm 0.08$ . The average value of % body fats was significantly reduced in all the tested patients by  $1.65 \pm 0.23$ , a waist circumference by  $7.85 \pm 3.01$  cm. Body mass loss and reduction of BMI were significantly higher in boys than in girls. Type 2 diabetes was detected in three adolescents (0.30%).

#### DISCUSSION

Urbanization, industrialization, globalization of markets and economic growth have influenced the sudden changes in lifestyle and diet "nutritional transition" in our country, too. Increased intake of high energy density food and high consumption of fats, especially saturated ones, and an inadequate intake of complex carbohydrates, fruit and vegetables along with a sedentary lifestyle and a low energy consumption, significantly contributed to the rise of obesity in our society (16).

Obesity in children can lead to insulin resistance, type 2 diabetes (T2DM), metabolic syndrome, hypertension, liver steatosis, accelerated growth and bone maturation, gynecomastia in boys, ovarian hyperandrogenism in girls and cholecystitis. Obese children are at increa-

sed risk for orthopedic and respiratory diseases and a number of psychological problems.

Alarming spread of the obesity epidemic in children and adolescents, as well as the absence of proven and effective measures and programs to prevent obesity indicate to the necessity of establishment the Centre for prevention and treatment of obesity in children and adolescents and the Čigotica program in the Special Hospital "Čigota". Overweight and obese children aged from 12 to 18 have been sent to the Centre from school health centres and pediatric wards from all over Serbia. Over the last five years, 3100 patients from more than 30 towns in the Republic of Serbia from different religious, national, linguistic and socio-economic backgrounds have been treated and educated at the Centre. 15% of the patients financed themselves their treatment.

The increase in the prevalence of obesity in the population of children and adolescents is associated with the complications of obesity, which used to be noticed only in adults, such as T2DM and other disorders in the regulation of glucose (14,15). The incidence of type 2 diabetes mellitus in the population of children and adolescents varies considerably in different parts of the world, with a significantly higher prevalence in the United States of America and the countries of Asia as compared to Europe. According to several studies in the population of obese children and adolescents in the USA, the prevalence of diabetes mellitus type 2 is from 1.3% to 6%, and the incidence of the disorder in glucose tolerance 17-25%. Type 2 diabetes was detected in three adolescents (0.30%).

Type 2 diabetes was detected in three adolescents (0.30%). Obese children and adolescents are at a higher risk of developing diabetes mellitus type 2. A disorder in the regulation of blood glucose indicates the risk of developing that disease. Obesity and insulin resistance in children create a predisposition for vascular complications in later years. Excessive obesity already in the age of 9-11 leads to reduction of elasticity of carotid arteries and obesity in adolescence to thickening

of media carotid arteries in young adults (16). The Bogalusa study showed that the prevalence of fibrous plaques in aorta and coronary arteries increased with age and positively correlated with BMI z-score, the concentration of triglycerides and cholesterol and blood pressure (17).

Short-term effects of treatment of our patients to a body composition were satisfactory, however, it is necessary to have a long-term monitoring which would confirm that the effects persist also after the completion of the intervention. The evaluation of a large number of programs for prevention of obesity shows that there was no significant effect in the prevention of body mass increase. This indicates the complexity of changes in healthy lifestyle as a key for prevention of putting on weight (18). The advantage of our program is it lasts short, it is intensive and all the examinees voluntarily consented to the treatment. It is known that the interventions which lasted relatively shorter, led to higher effects than those that lasted longer. Interventions that last longer are characterized by frequent giving up of children from the treatment. Children and young people are interested in fast and intensive interventions, which will give the desired results in a shorter period of time. Also, respondents who apply themselves and who are participants in the program, are more motivated to participate in the program and change their habits.

Our experience indicates that for a successful obesity treatment, these are necessary the time, a multidisciplinary team, good coordination and organization of the entire program. A significant part of the team the very patients. Working in a group with participants of similar age proved to have beneficial impacts on solving many of obesity problems. During the treatment, children give support and encouragement to each other. Work in such groups helps individuals to change unhealthy lifestyle and to choose healthy ways of thinking and behavior, to adopt new attitudes, improve interpersonal relationships, overcome fears and problems. And after the program, they keep in touch and serve as external controls in regard to the eventual return to the old habits.

As the influence of the family surrounding is one of the leading ones when it comes to adoption of attitudes and behaviors related to lifestyle habits, therapeutic interventions include family and are directed to it. The weak point of our program is the contact with parents only at the admission and at release from the Centre, but we try to be in contact with them during the stay of children in the program, and after it, too. Cooperation with parents provides a joint solving of actual problems, and they receive instructions how to support children in order to successfully continue the treatment after the program completion.

The main goal and the key element of the Čigotica program is raising awareness of adolescents about individual responsibility for their own health and adoption of a healthy lifestyle, acceptance of personal responsibility and developing a high level of motivation to continue the treatment.

A great interest of children, adolescents and their parents and of primary health care physicians to participate in the program of obesity prevention and treatment has justified the establishment of our Center. We do hope that our experience and the results will give a significant contribution to continuing the struggle against this serious public-health problem.

#### CONCLUSION

A multidisciplinary approach to the treatment in the Čigotica program leads to a significant body mass reduction, improvements of metabolic risk factors, aerobic capacity and self-esteem of adolescents. The great interest of children, parents, pediatricians and their participation in the program Čigotica indicates to the increase of awareness about the risks of obesity and the importance of preserving the health of adolescents in our society. The efficiency of Čigotica program and multidisciplinary treatment of obese adolescents will be evaluated in the current research that considers the sustainability of achieved results.

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Author declare no conflict of interest.

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### Sažetak

#### CENTAR ZA PREVENCIJU I LIJEČENJE PRETILOSTI U DJECE I ADOLESCENATA

S. Lešović

*Kao odgovor na epidemijsko širenje pretilosti u djece i adolescenata, u Srbiji je 2008. godine osnovan Centar za prevenciju i liječenje pretilosti u djece i adolescenata u Specijalnoj bolnici "Čigota" te je razvijen multidisciplinarni program zdravstvene skrbi nazvan "Čigotica". Program promovira zdravi stil života i sastoji se od dijetetskih intervencija sa smanjenjem ukupnog dnevnog unosa kalorija, planirane tjelesne aktivnosti, drugih terapijskih mjera (lijekovi), edukacije i psihološke potpore. Sudjelovanje u programu Čigotica nudi adolescentima mogućnost izbora između zdravog i nezdravog načina života i pomaže im prepoznati ključne čimbenike neophodne za dugoročnu promjenu ponašanja i usvajanje zdravih životnih navika. Kratkoročni učinci programa Čigotica ohrabruju i ukazuju kako multidisciplinarni pristup vodi do značajnog smanjenja tjelesne mase, regulacije arterijskog tlaka i metaboličkih čimbenika rizika, poboljšanje aerobnog kapaciteta i samopouzdanje u pretilih adolescenata. Veliki broj adolescenata ima komplikacije uzrokovane pretilošću te je učestalost dijabetesa tip II u ispitanoj skupini bila 0,3%, što ukazuje na činjenicu da problem pretilosti nije prepoznat na vrijeme, kako od roditelja, tako ni od zdravstvenih djelatnika, što ukazuje na potrebu za postojanjem učinkovitijih programa prevencije. Učinkovitost programa Čigotica i multidisciplinarnog liječenja pretilih adolescenata biti će procijenjena ovim istraživanjem koje razmatra održivost postignutih rezultata.*

Deskriptori: PRETILOST, ADOLESCENTI, INDEKS TJELESNE MASE, DIABETES MELLITUS TIP 2

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