Prekomerna prehranjenost slovenskih osnovnošolskih otrok

Overweight of Slovenian school children

Avtor / Author

Ustanova / Institute

Nataša Marčun Varda[1,3], Natalija Hanželj[2]

[1]Univerzitetni klinični center Maribor, Klinika za pediatrijo, Maribor, Slovenija; [2]Univerzitetni klinični center Maribor, Maribor, Slovenija; [3]Medicinska fakulteta, Univerza v Mariboru, Katedra za pediatrijo, Maribor, Slovenija

[1] University Medical Centre Maribor, Division of Paediatrics, Maribor, Slovenia; [2]University Medical Centre Maribor, Maribor, Slovenia; [3] University of Maribor, Faculty of Medicine, Department of Pediatrics, Maribor, Slovenia

Ključne besede:
debelost, epidemiologija, otrok, zdrav življenjski slog

Key words:
obesity, epidemiology, child, healthy lifestyle

Članek prispel / Received
15.03.2015
Članek sprejet / Accepted
03.04.2015

Naslov za dopisovanje / Correspondence
Izr. prof. dr. Nataša Marčun Varda, dr. med.; Klinika za pediatrijo, Univerzitetni klinični center Maribor, Ljubljanska 5, 2000 Maribor, Slovenija
Telefon +386 23212416
Fax +386 23312393
E–pošta: natasa.marcunvarda@amis.net

Izvleček

Namen: *V raziskavi smo želeli ugotoviti razširjenost prekomerne prehranjenosti in debelosti pri šolskih otrocih v starosti od 6. do 15. leta. Poleg tega smo želeli izboljšati osveščenost populacije o pomenu debelosti kot kronične bolezni in izvedeti, kakšno je znanje o vzrokih in zdravljenju debelosti pri naših osnovnošolcih. Ti podatki bi nam služili za usmerjanje preventivne dejavnosti na tem področju.*

Metode: *V raziskavo smo vključili 966 slovenskih otrok v starosti od 6 do 15 let. Raziskavo smo izvajali v letih od 2012 do 2013 s pomočjo anketnega vprašalnika. Vprašalnik je zajemal epidemiološke podatke o prekomerni prehranjenosti. Anketo smo obdelali s statističnim programom SPSS za okolje Windows 17.0.*

Rezultati: *Prekomerno prehranjenost smo ugotavljali pri 12,7 % otrok, od tega je bilo 8,4 % prekomerno prehra-*

Abstract

Purpose: *The purpose of our research was to determine the prevalence of overweight and obese school children 6-15 years of age. We wanted to determine the children´s knowledge about obesity and treatment for obesity. We also wanted to raise awareness about obesity as a chronic disease. The results of the current could facilitate targeting prevention activities.*

Methods: *The study included 966 children, 6-15 years of age, from different primary schools in Slovenia. The study was conducted from 2012-2013 using a questionnaire to acquire epidemiologic information about overweight children and was processed using basic statistical methods with SPSS.*

Results: *We showed that 12.7% of children were overweight; 8.4% of children were in the overweight category and 4.3% were in the obese category. Of the enrolled children,*

njenih, 4,3 % pa debelih. 77 % otrok je menilo, da imajo primerno telesno težo. Večina otrok je menila, da so njihove prehranjevalne navade primerne. Kljub temu je le 66 % otrok imelo 5 obrokov dnevno in 61 % reden zajtrk. Polovica otrok je navajala aktivno ukvarjanje s športom, okoli 70 % otrok pa manj kot 2 uri posameznih sedečih aktivnosti dnevno.

Zaključek: *Raziskava je pokazala, da se Slovenija uvršča med države z nižjo stopnjo prekomerne prehranjenosti. Seznanjenost z debelostjo kot kronično boleznijo in z možnimi načini zdravljenja je relativno slaba, kar govori o potrebi po preventivi na tem področju, ki mora biti široko zastavljena.*

77% were of the opinion that their eating habits were suitable, despite the fact that only 66% had 5 meals per day and 61% had breakfast every day. One-half of the children claimed to be physically active and 70% were sedentary < 2 h daily.

Conclusion: *With respect to excessive nourishment of children, Slovenia ranks lower than other countries. Knowledge about obesity as a chronic disease among Slovenian school children was limited, as was knowledge about different treatments for obesity. Thus, there is a public health need to prevent childhood obesity.*

INTRODUCTION

Obesity is defined as a state of excess body fat that presents an increased risk of co-morbidities and/or premature death (1). In many countries, childhood obesity is defined as a body mass index (BMI) greater than the 95th percentile and overweight as a BMI greater than the 85th percentile for gender and age (2). In adults, overweight is defined as a BMI > 25 kg/m^2 and obesity as a BMI > 30 kg/m^2 (3). The BMI is a ratio between weight (in kg) and the height (in m) squared (3). Other indicators of obesity are also available for children, such as waist circumference (WC), but only for some ethnicities. In adults, the WC cut-off value is 94 cm and 80 cm for men and women, respectively (4).

In recent years an increase in childhood obesity has been reported, and has reached epidemic proportions (5). According to a study conducted in 2011 and 2012, obesity affects 17% of American children and adolescents (6). Studies in adolescents have shown that approximately 30% of American and 22%-25% of European adolescents are overweight or obese, with the exception of the Czech Republic and Italy, where the prevalence of overweight or obese adolescents was 13.7% and 17.9%, respectively (7). Furthermore, research has shown that the number of obese children in the United States has tripled since 1980, which means a more rapid increase in children than in adults (8). In recent years childhood obesity has reached a plateau. Even if this is true, the occurrence of obesity in children and adults is very high and represents not only a major public health problem, but also a large economic burden (9).

An increase in the incidence of obesity has been observed, even in very young pre-school children. Thus, the World Health Organization, according to reports from 144 countries, estimated that the prevalence of obesity in children < 5 years of age increased from 4.2% in 1990 to 6.7% in 2010; according to projections, the prevalence of obesity is expected to reach 9.1% in 2020 (10). Estimates for the prevalence of obesity in 2010 are higher in developed countries (11.7%) than developing countries (6.1%), although it has been determined that the relative changes in the prevalence of obesity in developing countries are even higher, especially for countries in Africa (10). Globally, upward trends in obesity in very young children have raised concerns about the need to diagnose obesity in infancy (11). With respect to the prevalence

of childhood obesity, considerable differences exist between different countries. The highest prevalence of childhood obesity occurred in countries such as Albania, Bosnia, Herzegovina, and the Ukraine, with a prevalence of > 25% (10).

Data involving the overweight in Slovenia are occasionally published by the National Institute of Public Health (12). In 2005, a study was published that showed 18.4% and 20.9% of 5-year-old boys and girls were overweight, of whom 9% and 7.9% were obese, respectively (13). In adolescents 15-16 years of age, 17.1% and 15.4% of boys and girls were overweight, of whom 6.2% and 3.8% of boys and girls were obese, respectively (13).

The aim of our study was to determine the nutritional status of school children of different age groups in the northeastern region of Slovenia. At the same time, we were interested in determining the level at which children understand the etiology of weight disorders and what children know about available treatment because such information is not currently available. In addition, we wanted to teach children about obesity as a chronic disease.

MATERIAL AND METHODS

The current study was an epidemiologic, prospective study. The study was held from 2012-2013. Data were collected using an anonymous questionnaire. The study was approved by the Ethics Committee of University Medical Centre Maribor (number 97/12). Consent to participate in the study was signed by the children´s parents.

Nine hundred sixty-six children in the 1st-9th grade of 4 primary schools from the northeastern region of Slovenia were included in the study. Children in grades 1-5 answered the questionnaire at home with their parents and children in the 6th-9th grade answered the questionnaire in school. The questionnaire consisted of questions involving general anthropometrics, nutrition, sports activities, and free time. The questionnaire also included questions about obesity as a chronic disease and available treatment. In addition, a short, didactic lecture was presented on the importance of prevention and treatment of obesity.

Data analysis was performed using SPSS for Windows 17.0. Nutritional status was calculated according to the German percentile tables, in which overweight was defined as a BMI greater than the 90th percentile and obesity as a BMI greater than the 97th percentile for age and gender (14). Data were analyzed using basic statistical methods. A p value < 0.05 was considered statistically significant.

RESULTS

Nine hundred sixty-six children were involved in the study, which represents approximately 1% of the population of primary school children in Slovenia. Children 6-15 years of age were included in the study. Among the respondents, 483 (51%) were girls and 470 (49%) were boys; 13 children did not answer the questionnaire question regarding gender. Of the respondents, 59.7% completed the questionnaire at school and 40.3% of the children completed the questionnaire with their parents at home.

Of the boys, 15.8% were overweight based on BMI, of whom 4.7% were obese. Of the girls, 9.8% were overweight, of whom 3.9% were obese. Among all children, 12.7% were overweight and 4.3% of them were obese. The distribution of nutritional status is

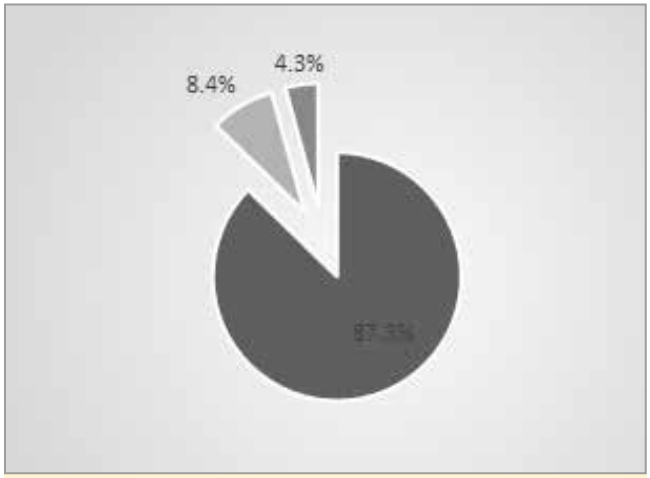

Figure 1. *Prevalence of overweight and obesity in children.*

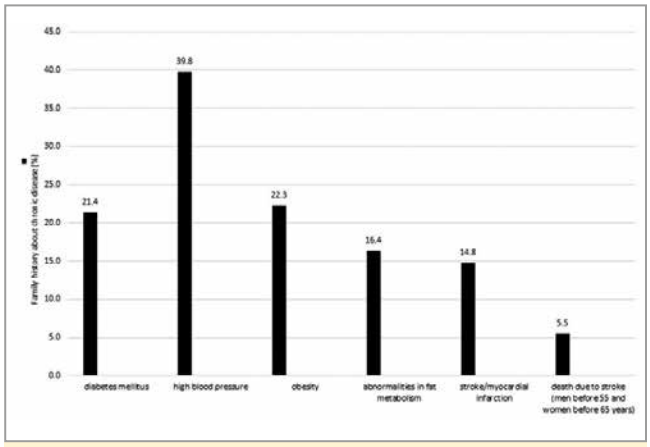

Figure 2. *Overweigt according to different age groups.*

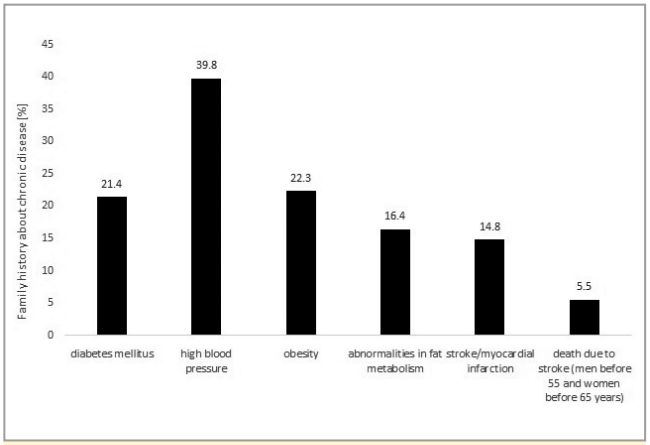

Figure 3. *Family history of cardiovascular diseases in school children.*

shown in Figure 1, and the distribution of overweight children by age is depicted in Figure 2.

Data on the family burden of cardiovascular diseases are shown in Figure 3.

Information about eating habits show that 21.5% of children have only 2-3 meals a day, 66.5% have 5 meals, and 11.9% have > 5 meals per day. Nearly two-thirds of children (61.7%) eat breakfast every day, 14.6% eat breakfast > 3 times a week, 18.1% eat breakfast on the weekends, and 5.7% never eat breakfast. Nearly all children (96.6%) eat a variety of foods, 1.6% follow a vegetarian diet, 0.2% adhere to a vegan diet, and 0.8% eat fast food.

Data on the frequency of use of certain types of foods are shown in Table 1 and the frequency of consumption of various beverages is shown in Table 2. Food intake was considered adequate by 84.5% of children, 9.9% reported that they eat too much, and 5.5% thought that they do not eat enough. Approximately three-fourths of children (77%) were satisfied with their body weight. 2.1% of children smoke cigarettes, and 13% consume alcohol.

More than one-half of children (58%) were active in sports activities. Among obese children, a slightly smaller percentage actively participated in sports, but the difference was not statistically significant compared to normoweight children.

Table 3 shows the sedentary activities with respect to time limitations.

Knowledge of the etiologic factors underlying the development of obesity based on the interviews with children is shown in Table 4.

DISCUSSION

The study included 966 primary school children from different parts of northeastern Slovenia. Although we were unable to cover the entire area of Slovenia, based on the size of the sample, it is our opinion that the data can be extrapolated to the population of Slovenian primary school children. The distribution by gender was uniform, as was the distribution by age groups. It is important to note that all children from the 4 primary schools were included in the study, presenting a representative sample of approximately 1% of the Slovenian primary school population.

Of the children, 12.7% were overweight, of whom 4.3% were obese. It is possible that the prevalence of overweight and obese children was underestimated because some of the children did not provide honest answers. Subjectivity is always present when data are collected via questionnaire, even though the questionnaire is anonymous and confidential. The children's satisfaction with their own body weight (77%) is consistent with self-criticism of being overweight. According

Table 1. *Intake of diferent types of food in school children*

	Every day	Several times a week	Several times a month	Never
Bread	78.9 %	19.3 %	1.7 %	0.1 %
Macaroni, potatoes	14.4 %	76.0 %	9.4 %	0.2 %
Meat	31.8 %	63.5 %	3.2 %	1.5 %
Fruits	69.6 %	26.0 %	4.1 %	0.3 %
Vegetables	58.7 %	32.9 %	6.0 %	2.4 %
Fish	1.0 %	19.2 %	71.9 %	7.9 %
Sweets	28.2 %	56.9 %	13.6 %	1.3 %
Fast food	3.2 %	8.7 %	73.2 %	14.9 %

Table 2. *Intake of different types of drinks in school children*

	Every day	Several times a week	Several times a month	Never
Water	93.1 %	5.2 %	1.3 %	0.4 %
Milk	47.3 %	40.4 %	8.0 %	4.3 %
Tea	28.0 %	49.5 %	20%	2.5 %
Juices	39.1 %	41.4 %	17.7 %	1.8 %
Fizzy drinks	7.2 %	23.0 %	45.1 %	24.7 %
Coffee	3.4 %	5.1 %	7.7 %	83.8 %

Table 3. *Sedentary activities in scool children*

	< 2 h a day	2-5 h a day	> 5 h a day	Never
Watching television	79.1 %	16.4 %	1.8 %	2.7 %
Computer	75.4 %	14.5 %	2.5 %	7.6 %
Learning	70.8 %	27.3%	1.9 %	2.2 %
Videogames	49.5 %	7.4 %	1.8 %	41.3 %

Table 4. *The knowledge about etiologic factors of obesity development in school children*

	Not important	Less important	Important	Very important
Heredity	14.7 %	33.3 %	40.8 %	10.9 %
Unhealthy food	2.7 %	3.4 %	27.6 %	68.3 %
Lack of physical activity	2.8 %	3.1 %	27.3 %	66.5 %
Smoking	26.5 %	30.5 %	25.6 %	17.4 %
Alcohol	18.5 %	24.4 %	34.7 %	22.4 %
Medications	15.0 %	30.0 %	36.3 %	18.0 %
Sedentary activities	6.6 %	10.9 %	43.2 %	39.3 %

to a published study, perception of weight varies with BMI (15). Thus, a suitable weight is present in 87.4% of normoweight adolescents, in 76% of overweight adolescents, and in 41.9% of obese adolescents (15).

Based on a review of the literature in Slovenia, we did not find a study as complete as the current study covering the population of primary school children. In 2005 a study which focused on the problems associated with overweight 5-year-old children and adolescents was published (13), which showed that approximately one-fifth of 5-year-old children and more than one-sixth of adolescents were overweight (13). Our data suggest a slightly lower prevalence of weight disorders

in Slovenia, which may reflect the methodology used. Looking at the data of 6-year-old children and adolescents in the current study, nearly 10% of 6-year-old children and 6% of adolescents were overweight.

If we compare our data with the prevalence of weight disorders in children and adolescents in other countries, we note that most research indicates a slightly higher incidence of children and adolescents who are overweight and obese, especially the latter. According to the data reported herein, Slovenia is comparable to developing and underdeveloped countries with respect to childhood and adolescent weight disorders. Of African adolescents, 14.4% and 5.3% are overweight and obese, respectively (7). In the majority of European countries the prevalence of obesity in children and adolescents is approximately 6%, and the prevalence of overweight is approximately 18% (7). The exception to this trend is the Czech Republic, where 1.4% of children and adolescents are obese, which is significantly lower compared to the findings of the current study (7). The percentage of overweight children and adolescents is comparable to the results herein, in the range of 12.3% (7). A slightly lower prevalence of obesity in children and adolescents exists in neighboring Italy (2.3%), but the prevalence of overweight children and adolescents exceeds our results and was reported to be 15.6% (7). Data for Greece indicate slightly higher percentages of children and adolescents who are overweight (18.3%) and obese (4.3%), which are greater than the European average (7). In Serbian primary school children, 28.9% of boys and 17% girls are overweight, while 14.5% of boys and 8.1% of girls are obese (16). A significantly higher prevalence of obesity (16.4%) has been published for American children (7).

Our data are important because the data were obtained from a large sample of primary school children and included the entire population of school children with data regarding the prevalence of overweight and obese children by age group at the same time. This is important for planning preventive and educational measures at the local and national levels.

For each nation is good and important to have its own data on relevant pathology, such as obesity, one of the most common chronic diseases in modern society with severe consequences on health. Furthermore, with a relatively simple and economically-justifiable measure, obesity could be successfully prevented. Among the latter, education and warning of early detection and prevention, as well as early treatment, if necessary, is undoubtedly important. In addition to data acquisition, our research focused on warning of the importance of obesity from both an individual and global perspective.

Thus, it is important to emphasize the methodology of data acquisition. In addition to the fact that questionnaires are subjective, standardization is important, and usually presents a significant problem. Our questionnaire was the result of our own work, drawn up on the basis of the most important problems that we have noticed in the relevant literature.

Part of the questionnaire was devoted to the lifestyles of subjects included. Our research has shown that most children believe that their eating habits are appropriate. Greater than 90% of primary school children claim that the quality of food they consume is adequate. There are very few children who acknowledge they subscribe to vegetarian and vegan diets. Additionally, very few children eat fast food. Only 5% of children had the highest calorie intake in the evening. Ten percent of children felt that their calorie intake was too high, which is consistent with the results about prevalence of overweight children and adolescents demonstrated in the current study. Despite this, only 66% of children had 5 meals a day and 61% ate breakfast regularly.

The data regarding the consumption of fruit and vegetables are encouraging because approximately 70% of children eat fruit and 60% eat vegetables daily. A similar survey conducted on Lithuanian children showed significantly worse results (17). Specifically, only 21.1% of boys and 27.1% girls eat both fruits and vegetables every day. Daily vegetable consumption was acknowledged by 24.9% of boys and 29.6% of girls

and daily fruit consumption by 23.1% of boys and 31.9% of girls (17). Data for Slovenia in 2008 showed that 32% of children eat fruit daily and 43.6% of children eat vegetables daily, which is significantly less than data received in the current study (12).

The data involving consumption of fish are also of concern because one-fifth of children ate fish several times a week, and 7.9% of children never ate fish. Similarly, nearly one-third of children eat sweets every day. In contrast, a relatively small percentage of children eat fast food. The data from the National Institute of Public Health of the Republic of Slovenia also indicate that approximately one-fourth of children eat sweets every day and one-third of children drink beverages with sugar added (12).

Data on sport activities are reassuring, as one-half of the children stated that they are actively engaged in sports activities. The data are probably an overestimate, which may be the result of the methodology used. The results do not indicate that over-nourished children are significantly less physically active in comparison to normally-nourished children.

According to the guidelines of the World Health Organization, adolescents should engage in moderate-to-intense physical activity for at least 60 minutes a day every day of the week. The Health Behavior in School-aged Children (HBSC) survey showed that this guideline is achieved by only 17.6% adolescents in Slovenia, which is not in agreement with the current study (12). A study conducted on Taiwanese school children reported that 46.1% of children are actively engaged in sports, which is comparable to the current data (18). The survey, which took place in Serbian school children, confirmed that the greatest risk factor for the development of obesity, in addition to skipping breakfast, was inadequate physical activity. Specifically, children who are physically active < 7 hours per week are much more prone to obesity than children who are physically active > 7 hours a week (16). According to the information obtained for sedentary activities, we believe that a sedentary lifestyle in our children was a significant problem. The percentage of children who have sedentary activity limited to < 2 hours per day was high; however, all of the sedentary activities together accounted for > 2 hours per day, which supports the problem of sedentary activities brought about by a modern lifestyle. A similar situation has been noted in other studies (19, 20). In Bologna and Crotone (Italy), a study was conducted investigating anthropometric indicators, lifestyle, and playing sports in school-aged children that showed a significant difference in overweight children between the two cities, as well as differences in physical and sedentary activities, which were correlated (19). Thus, the prevalence of overweight children in Bologna was 20.6% for boys and 12.7% for girls, and in the city of Crotone 46.7% of boys and 49% of girls were overweight (19). In the city of Crotone, the percentage of children with a sedentary lifestyle was significantly higher compared to the city of Bologna (19).

A study showed that Colombian children were not physically active and engaged in a lot of sedentary activities (20). The data from the Slovenian Institute of Public Health indicated that excessive sedentary activities are present in one-third of Slovenian adolescents (12).

It should be noted again that the questionnaire was a subjective assessment of the perception of certain problems, so that the results of the survey may be overestimated.

The survey results showed that our primary school children are unaware of obesity as a chronic disease, the etiology, and the appropriate methods of treatment. Thus, less than one-half of the primary school children know the importance of genetics in the development of weight disorders, but they are familiar with the importance of nutrition and physical activity. Indeed, 20% of children do not know the importance of sedentary activities. Moreover, 51.5% of overweight children desire additional information about weight disorders, and 26% of children indicate that they are not aware of the possibility of hospital treatment of obesity, especially weight loss under control. We have not identified research that addresses the problem of

obesity as a chronic disease. Our data clearly show the need for further education in this field because there is a poor understanding of obesity and available treatments. We believe that education is an important factor in preventing obesity and all chronic complications associated with obesity. With education, it is necessary to begin in the earliest stages with children at all levels. It is most effective if education is included in the public health strategy.

CONCLUSIONS

It is common for Slovenian primary school children to be overweight and obese. Specifically, 12.7% and 4.3% of Slovenian children are overweight and obese, respectively. Compared to neighboring countries, the situation involving overweight and obese children in Slovenia is more favorable. The lifestyle of Slovenian primary school children, according to the opinions of children and their parents, is appropriate. Greater than one-half of Slovenian children and their parents believe that they have adequate dietary habits and that they are physically active. Approximately two-thirds of children consume fruits and vegetables daily. In contrast, the survey showed that the intake of sweets is relatively common. In addition, the results about consumption of fish are concerning. Surprisingly, small number of children eat fast food. One-third of children drink juices and tea daily; however, data regarding the consumption of fizzy drinks and coffee are good. Slovenian school children are poorly informed about obesity as a chronic disease and have relatively poor knowledge of the possible methods of treatment, which speaks in favor of the need for preventive action and education regarding weight disorders.

REFERENCES

1. Lobstein T, Baur L, Uauy R; IASO International Obesity Task Force. Obesity in children and young people: a crisis in public health. Obes Rev 2004; 5 (Suppl 1): 4-104.
2. Gotmaker SL, Must A, Perrin JM, Sobol AM, Dietz WH. Social and economic consequences of overweight in adolescence and young adulthood. N Engl J Med 1993; 329: 1008-12.
3. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of obesity in the United States, 2009-2010. NCHS Data Brief 2012; 82: 1-8.
4. Hara K, Matsushita Y, Horikoshi M, Yoshiike N. Yokoyama T, Tanaka H, et al. A proposal for the cutoff points of waist circumference for the diagnosis of metabolic syndrome in the Japanese population. Diabetes Care 2006; 29; 1123-4.
5. Lobstein T, Jackson-Leach R. Child overweight and obesity in the USA: prevalence rates according to IOTF definitions. Int J Pediatr Obes 2007; 2: 62-4.
6. Ogden CL, Caroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011-2012. JAMA 2014; 311: 806-14.
7. Bibiloni MdelM, Pons A, Tur JA. Prevalence of overweight and obesity in adolescents: a systematic review. ISRN Obes 2013; 2013: 392747.
8. Ogden CL, Carroll MD. Prevalence of obesity among children and adolescents: United States, trends 1963-1965 through 2007-2008. Health E-Stat 2010: 1-5. Available January 5, 2015 from: http://www.cdc.gov/nchs/data/hestat/obesity_child_07_08/obesity_child_07_08.pdf
9. Babey SH, Hastert TA, Wolstein J, Diamant AL. Income disparities in obesity trends among California adolescents. Am J Public Health 2010; 100: 2149-55.
10. de Onis M, Blossner M, Borghi E. Global prevalence and trends of overweight and obesity among preschool children. Am J Clin Nutr 2010; 92: 1257-64.

11. McCormick DP, Sarpong K, Jordan L, Ray LA, Jain S. Infant obesity: are we ready to make this diagnosis? J Pediatr 2010; 157: 15-9.
12. Jeriček Klanšček H, Roškar S, Koprivnikar H, Pucelj V, Bajt M, Zupanič T, eds. Health and health associated behaviour inequalities of Slovenian adolescents. Ljubljana: The National Institute of Public Health of the Republic of Slovenia, 2011.
13. Avbelj M, Saje-Hribar N, Sehner-Zupančič M, Brcar P, Kotnik P, Iršič A, et al. Overweight and obesity prevalence among 5 year old children and 15 to 16 year old adolescents in Slovenia. Zdrav Vestn 2005; 74: 753-9.
14. Kromeyer-Hauschild K, Wabitsch M, Kunze D, Geller F, Geiß HC, Hesse V, et al. Percentiles of body mass index in children and adolescents evaluated from different regional German studies. Monatsschr Kinderheilkd 2001; 149: 807-18.
15. Sarafrazi N, Hughes J, Borrund L, Burt V, Paulose-Ram R. Perception of weight status in U.S. children and adolescents aged 8-15 years, 2005-2012. NCHS Data Brief 2014; 158: 1-7.
16. Boričić K, Simić S, Vasiljević N, Marinković N. Risk factors associated with overweight among adolescents. Zdrav Var 2014; 53 : 283-93.
17. Zaborskis A, Lagunaite R, Busha R, Lubiene J. Trend in eating habits among Lithuanian school-aged children in context of social inequality: three cross-sectional surveys 2002, 2006 and 2010. BMC Public Health 2012; 12: 52.
18. Chen LJ, Fox K R, Haase A, Wang JM. Obesity, fitness and health in Taiwanese children and adolescents. Eur J Clin Nutr 2006; 60: 1367-75.
19. Toselli S, Brasili P, Iuliano T, Spiga F. Anthropometric variables, lifestyle and sports in school-age children: comparison between the cities of Bologna and Crotone. Homo 2014; 65: 499-508.
20. González SA, Sarmiento OL, Cohen DD, Camargo DM, Correa JE, Páez DC, et al. Results from Colombia's 2014 report card on physical activity for children and youth. J Phys Act Health 2014; 11 (Suppl 1): S33-44.