



CHILDHOOD OBESITY – RISK FACTORS AND PREVENTION

OTYŁOŚĆ DZIECIĘCA – CZYNNIKI RYZYKA I ZAPOBIEGANIE

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ABSTRACT

Obesity has been identified by the World Health Organisation as a complex and global health problem which is caused by the combination of genetic impacts and environmental factors. In the last period, there is an increased incidence of obesity in children, which is due to the high prevalence of multiple complications and increasing more acute health problems in childhood in the economically developed countries, including Slovakia. The period of risk is puberty, when the body can reproduce fat cells the number of which persists throughout life. The aim of the article is to highlight the increasing trend of childhood obesity and its negative impact on health and mental condition of the child, as well as to point out health consequences of childhood obesity in adult life, to explain the factors which according to the research mostly influence obesity in childhood during school-age period in Slovakia, and to emphasize preventive potential of nutrition in the development of a healthy lifestyle.

KEYWORDS: children obesity, prevalence, prevention, risk factors.

STRESZCZENIE

Światowa Organizacja Zdrowia uznała otyłość za skomplikowany ogólnoswiatowy problem zdrowotny, który powstał w wyniku kombinacji uwarunkowań genetycznych oraz czynników środowiskowych. W ostatnim okresie zauważamy wzrost występowania otyłości również u dzieci. Ze względu na dużą częstość występowania oraz liczne komplikacje staje się ona coraz bardziej widocznym problemem wieku dziecięcego w krajach ekonomicznie rozwiniętych, włączając w to również Słowację. Okresem ryzyka jest okres dojrzewania, kiedy to definitywnie rozmnożyć mogą się komórki tłuszczowe, których ilość pozostaje na całe życie. Cele artykułu to zwrócenie uwagi na wzrastający trend występowania otyłości u dzieci oraz jej negatywny wpływ na stan zdrowia i psychiki dziecka, jak również na skutki zdrowotne otyłości dziecięcej w dorosłości, prezentacja czynników, które – jak wywnioskowano – mają największy udział w powstawaniu otyłości dzieci w wieku szkolnym na Słowacji oraz podkreślenie zapobiegawczego potencjału odżywiania w procesie kształtowania zdrowego stylu życia.

SŁOWA KLUCZOWE: otyłość u dzieci, częstość występowania, zapobieganie, czynniki ryzyka.

Introduction

Overweight and obesity in children and adolescents refers to a worldwide health problem requiring the attention of both experts and laymen.

The Slovak population's health state studies revealed an increasing trend in diseases that are often caused by incorrect way of living. Global change of life conditions and lifestyle led to a positive energy balance and physical activity decrease resulting in increase of obesity that has achieved pandemic dimensions in many economically developed countries of the world during last two decades. Currently, the state of nutrition is considerably affected by the changes in alimentation of whole families, pre-dominant sedentary lifestyle and media impact leading to an increased prevalence of exogenous childhood obesity. There are only 4% of children having an endogenous cause of obesity. According to the WHO the number of obese people worldwide referred to ap-

proximately 200 million people in 1995 and it increased to 300 million people in 2000. Territorial differences in the number of obese people can be observed within single continents. While the occurrence refers to 10–25% in Europe, it reaches up to 40% in some ethnic groups in the U.S. The increase of obesity prevalence does not concern the adult population only but also children and adolescents in which it is a portent of serious health complications in the adulthood. According to the WHO statistics, 22 million children at the age of up to 5 and 155 million children at school age suffer from obesity. In European Union more than 14 million school-age children are overweight, out of which 3 million are obese. Annually, there is an increase of approximately 400 000 overweight children; almost every fourth child is affected. Statistics show that for example in Germany 10–18% of juveniles are overweight and 4–8% are obese. In younger age groups approximately 10%

of children are overweight and 5–8% are obese where in half of the cases there is an accompanying disease or at least one risk factor predisposing the emergence of serious complication [2]. According to Béderová [3] the incidence of childhood obesity in Slovakia refers to 12% and another 6% suffer from overweight. There is a rule that the earlier a child becomes obese and the higher obesity grade he/she has the higher chance of persisting obesity to adulthood [4]. According to some sources it refers to up to 70–80% children.

Prevalence of childhood obesity and overweight in the Slovak Republic

The first nation-wide anthropometrical survey in Slovakia was held within whole Czechoslovakia in 1951 and next surveys were conducted every first year of next decade. Thus, Slovak Republic ranked among countries having well monitored growth characteristics of child population. At the same time a long-term track of development trends of Slovak children and youth was acquired. Slovakia is one of a few countries of the world having its own elaborated national BMI standards at disposal. Compared to foreign data the average overweight data as well as childhood obesity prevalence increase in the Slovak republic belong to the lowest ones; however, when comparing data from previous periods there are obvious tendencies of BMI increase what can refer to an increasing obesity risk. In 2009 a survey focused on prevalence of selected risk factors and related diseases was conducted in the framework of the National program for the care of children and adolescents in coordination with the National Health Information Centre of the SR and the chief expert for the care of children and adolescents. Data of 1984 children and youth acquired by random selection from the database of general practitioners for children and youth from six regions of Slovakia were analyzed. Besides other data the authors focused on the overweight and obesity prevalence and increased blood pressure values. Compared with 2001 no statistically significant differences in obesity and overweight prevalence were determined. The incidence of obesity and overweight prevalence in the category of children aged 11 and 17 in both monitored periods is stated in **tables 1 and 2**.

Table 1. Obesity and overweight prevalence in Slovak boys and girls at the age of 11

	Boys		Girls	
	Obesity	Overweight	Obesity	Overweight
Year 2001	9.80%	5.80%	8.30%	5.60%
Year 2009	10.10%	8.50%	6.50%	7.20%

Table 2. Obesity and overweight prevalence in Slovak boys and girls at the age of 17

	Boys		Girls	
	Obesity	Overweight	Obesity	Overweight
Year 2001	7.60%	2.50%	6.70%	3.60%
Year 2009	7.70%	5.60%	9.40%	5.30%

The hypertension blood pressure values were 3–5 times higher in children having obesity compared to children with no overweight. The relation was statistically significant in both children aged 11 and 17. The hypertension values prevalence in children having overweight was 1.3–4 times higher; it was statistically significant in boys at the age of 11 only. The conclusions of the research show the necessity to monitor the risk health factors in the framework of primary care, national prevention programs [5]. The latest anthropometrical measurement in 11-years-old and 17-years-old boys and girls was made in 2011. The results have not been published yet. According to Kožuchová, Bašková [6], the authors of the research dealing with being on diet and schoolchildren's own figure self-evaluation in central Slovakia, 56.6% of respondents evaluate their figure positively, 4.8% of respondents consider their figure to be fat and 1.9% to be very fat. Dissatisfaction with figure in pubescent girls and attempts to lose weight can be connected with various changes in behaviour and can result in food intake regulation failures.

Consequences of obesity

Obesity is a serious health consequence of excessive intake of food with inappropriate composition and insufficient physical activity. It refers to health, aesthetic and psycho-social problem. With respect to health risks childhood obesity is more serious than adult obesity. The characteristic feature of common obesity is the fact that children do not grow out of it. Overweight means a burden of the locomotive system; it is a factor increasing the occurrence of locomotive system deformities and chronic diseases of respiratory system. At early age of obese children there are changes of their vessel walls manifested in adulthood by loss of their elasticity and high pressure diagnosed in the adolescent period. According to Šimurka [7] there is a positive correlation among the increasing BMI, total cholesterol level increase and the risk of early atherosclerosis. Obesity is one of the reasons of both cardiovascular and metabolic diseases such as diabetes mellitus type 2, gout, cholelithiasis, dislipidemia, fatty liver disease. Children having obesity which persists without changes up to adulthood suffer more often from cardiovascular diseases and diabetes mellitus. With respect to chronic

metabolic consequences the visceral fat tissue has got the highest activity taking a significant part in development of relative hypercortisolism, hyperestrogenism, insulin resistance and hypercoagulation. This chronic state is potentiated by prolonged failure of pancreas β cells, pro-atherogenic and pro-immunosuppressive state. Non-alcoholic liver steatosis has become the most frequent reason of liver diseases in paediatrics in the developed countries accompanying obesity epidemic in children obesitology, too. The obstructive sleep apnoea syndrome refers to a frequent respiratory complication in obese children. Its incidence increases from the age of 12 depending on BMI grade and it is three times higher in boys than in girls. A low-quality sleep negatively affects cognitive functions, concentration and may result in hyperactivity. In children having higher obesity grade the accumulation of fat in the neck area leads to the obstruction of upper airways and in the abdominal area to the development of hypoventilation resulting in somnolence connected with falling asleep during day as a consequence of accumulated carbon dioxide. There can be right ventricular heart failure in case of a long-term influence. Manifestations of post-burden breathlessness often impair as a consequence of low physical activity and in obese children asthmatic problems often impair, too. Patophysiological obesity mechanisms themselves affect mechanical properties of airways and stimulate pro-inflammatory processes of the respiratory tract [8, 9, 10]. Overweight is connected with psycho-social problems manifested in social discrimination by peers. Obese children are often the victims of bullying, intimidation; they are solitary, withdrawn, shy and this leads to frustration, depression and social discrimination. On the other hand, there can be increased manifestations of aggression, touchiness, stubbornness, unwillingness to respect other people or other emotional problems [2, 11, 12]. Spinal diseases, flat feet and other orthopaedic complications refer to a frequent problem of fast-growing obese children [13].

At the beginning, the consequences caused by childhood obesity are reversible and early diagnosing and treatment is a significant clinical challenge in the prevention of development of serious metabolic, organic, psychological and society-wide complications [10].

Factors affecting obesity

Recently, researches have focused on identification of prenatal factors conditioning obesity emergence. It is obvious that taste centre and important neuroendocrine system affecting adipogenesis and energy metabolism regulation is formed as early as during intrauterine development. Mother's nutrition state, mother's glucose metabolism, mother's smoking, birth weight and the

character of nursing diet are considered to be the decisive factors [14].

Genetic, environmental and pathological factors take part in origin and development of children obesity.

The reason why increasing obesity is so difficult to fight refers to its socio-economic substance lying in a changed lifestyle of most society shown by increased intake of high-calorie food. Obesity is a multi-factorial disease in whose aetiology genetic factors and factors of external environment are applied. According to Hlavatá [2] only 4% of children have endogenous obesity whose cause refers to hormonal imbalance or genetic disorder. Currently, the state of nutrition is considerably affected by the changes in alimentation of whole families, predominant sedentary lifestyle and media impact leading to an increased prevalence of exogenous childhood obesity. In up to 96% of cases the childhood obesity is caused by bad eating habits combined with lack of movement. The first year of life refers to a critical period for obesity emergence as a consequence of overfeeding as well as the adolescent period with pre-dominant influence of hormonal and psychogenic factors.

The incidence of obesity is closely connected with family variability including parents' obesity, higher social-economic position, parental upbringing, lack of movement, habit-forming eating schemes that children usually copy from their parents. Incorrect family or national traditions, formed personal bad habits in the form of pickiness or eating sweets often lead to imbalanced representation of essential nutrients in the food, preference of less valuable foods to the exclusion of high quality ones. Overfeeding can be seen in children who suffer from emotional deprivation and lack of understanding by close environment, loss of a close person, lack of success at school or in children who are bored [12].

Lisá [15] and Dorey et al. [16] state identically that childhood and adolescent obesity is caused by their lifestyle with lack of movement, low-quality nutrition and longer watching TV.

Several epidemiological researches point out the link between irregular eating regime and increased risk of obesity emergence. **Irregular food intake** affects both child's mental activity and prosperity and behaviour at school negatively [1]. In 2007 Children's Faculty Hospital with Polyclinic and Medical Faculty of the Comenius University in Bratislava made a study focused on nutrition and regime of school youth in relation to the risk of obesity emergence. There were 1000 children aged 6 to 16 from 10 districts of Slovakia who participated in the pilot study. The authors were evaluating schoolchildren's eating regime in dependence on their age, sex, residence in city or rural areas and mother's and father's education. The results showed

that 38,3% of children skip breakfast. Consumption of morning and afternoon snacks is regular; however, the composition thereof is not optimal. 95,4% of children have their lunch regularly; however, almost one third do not eat soups. Deficiencies in eating regime were more frequent in older children and in children from rural areas and lower educational groups. Peterková and Pavelková [17] who examined the obesity rate and the impact of age on children's eating habits on the sample of 755 schoolchildren of second grade of eight elementary schools state in the conclusion of the research that eating habits impair proportionally to age. They think that in younger children it is connected with higher interference with parents. A similar research focused on eating habits of younger school age children was conducted on the sample of 970 pupils of fourth class of the elementary school in Prešov self-governing region. According to the authors of the research [18] one of the most serious findings is a significant decrease of children's catering at the purpose-built school facilities. Only 29% of children use school catering guaranteeing the application of well-balanced diet principles regularly and 11% of children use it occasionally. There is an unfavourable development of the nutritional regime with the absence of breakfast, with nutrition-low meals for morning snacks and eating fast food as a main dish.

Physical activity plays a significant role in the prevention of childhood and adolescent overweight and obesity decreasing the risk of obesity in the adulthood [19]. Even if obese children's moveability is in generally lower, a relatively significant part of their energy output refers to activities connected with 'carrying' of the excessive weight and therefore total energy output of obese children is higher compared to non-obese children and decreased basal metabolism takes certain part in weight gain [20].

Nowadays, the trend of **decreased physical activity** can be observed in higher and higher number of children. According to some authors the volume of children and youth's physical activity has come below the level characterised as biological need. The state is a result of passive lifestyle. Similarly like in case of eating habits, parents' example is here often decisive, too. The authors of the research Šimonová, Vladovičová [21] analysed diaries where pupils recorded their common daily activities and duration time thereof and they found out that children devoted only 34,38% of their leisure time to physical activity. It referred especially to sport activities like swimming, cycling, skating, walking, football, housework (hoovering, cleaning and taking out the rubbish). The volume of physical activity stated above refers only to a half of the recommended 60% in spending leisure time in children.

The most frequent reason of decreased physical activity in children is **watching TV**, playing computer games or communication with friends on social networks. In the research dealing with watching TV in children from 25 schools of Banská Bystrica and Žilina region boys at the age of 11 and 13 (26%) spend their leisure time by watching TV the most frequently in duration of two hours a day during working days. At weekends 25% of boys at the age of 13 devoted their leisure time to watching TV [6]. The result of Crespo et al. [22] study also confirmed that children having overweight watch TV more than children having normal body weight. Increasing amount of time spent at TV is connected with the incidence of obesity not only because of lack of movement but also because of increased intake of food. The risk of childhood obesity is reduced each hour of medium intensive physical activity by 10% and it is increased each hour spent at computer or TV by 12% [23, 24].

Fialová [25] points out the **influence of advertisement** as one of the social factors leading to emergence of bad eating habits. The results of a Czech study from 2006 give a clear evidence of an unambiguous impact of advertisement on child population. Advertising food or drinks leads 50% of children to buy them immediately. While there is a prevailing influence of TV commercials in children, later on it is internet and on-line computer games. An effective way how to attract attention to sweets is putting them in shelves in the height of children's eyes or at supermarket cash desk and adding toys and computer games in the packets. 'More insidious' marketing way is placing vending machines with unsuitable foodstuff on places where children are without parents' supervision, e.g. schools. Caroli et al. [26] notify that a link to a higher energy intake was recorded as children are exposed to energy-rich food and drink ads and they often indulge in unhealthy snacks while watching TV.

Fialová [25] counts **breastfeeding** among factors affecting decrease of overweight risk positively. She recommends to breastfeed at least till six months of child's age. In spite of the fact that results of various long-term studies are not unanimous, there are prevailing conclusions on positive impact of a long-term breastfeeding as these children are protected from the emergence of obesity.

Obesity prevention

One of the most effective ways how to fight overweight and obesity is prevention. Pre-dominant role is played by parents' educational activity lying in forming suitable habits followed by application of single lifestyle rules. Besides parents' influence preventive strategies require

coordinated effort of all persons participating in child's upbringing and care. Participation of health care professionals and educators is irreplaceable. It must be supported by an adequate national strategy, by defining effective programs taking into account all attributes of obesity issue so that they support healthy lifestyle of the society. As for childhood obesity, the programs must be defined in the way reinforcing the feeling of own responsibility for his/her health in the form of a play, not bans and thus, to modify his/her behaviour naturally towards the intake of healthy food, influence his/her physical activity and lay the foundations of a healthy lifestyle [2]. With respect to the issue of obesity increase schools are expected to participate in forming lifestyle of their schoolchildren. Besides adequate increase of theoretical knowledge on well-balanced diet principles schools should support also physical activities ranging from making schoolchildren familiar with a wide spectrum of sport, club and circle activities to organising sport events at school and active support of talented pupils in the framework of the sport clubs. Schools should draw attention also to easy health-promoting physical activities like working in garden, housework or walking the dog. Activities promoting walking in all its forms, going upstairs and downstairs, cycling, skating or dancing refer to no less beneficial physical activities. Applying well-balanced diet principles and increasing physical culture of children and youth is a key factor of obesity prevention. Psychological factors are serious aspect of childhood obesity prevention, too. Hlavatá [2] states that when we want to achieve changes in child's lifestyle, it is crucial that he/she realizes right at the beginning the negative impact of obesity on his/her person, knows the troubles caused by obesity and realized mistakes that he/she makes when selecting food, dividing consumption of food during a day and selecting leisure time activities.

Conclusion

Nowadays, obesity and related health problems refer to a complex world-wide issue that emerged as a consequence of combination of genetic, behavioural, cultural and environmental effects. The solution requires not only changes of behaviour on the individual and family level but also interventions to health care policy and social area. Most experts recommend to start with obesity prevention as early as at childhood age when foundations of future lifestyle, eating habits are formed and when preventive programs are more likely to be successful than in adulthood. Lobstein and Jackson-Learch [27] state that it is the issue of the future what expects our children in their adulthood when currently in European Union there are 20 000 obese children having

diabetes mellitus of type two, 400 000 children having impaired glucose tolerance, more than a million obese children having symptoms of cardiovascular disease including hypertension and increased cholesterol levels, three or more symptoms of metabolic syndrome and more than 1,4 million children showing signs of liver damage.

References

1. Babinská K et al. Stravovací režim školákov na Slovensku. *Pediatrica pre prax.* 2007; 8(4): 217–220.
2. Hlavatá A. Obézne diéta v ambulancii lekára pre deti a dorast. *Pediatrica pre prax.* 2007; 8, S1: 12–16.
3. Béderová A. Príloha o racionálnej výžive v škole a rodine. *Prevenca a učitelia. Rodina a škola.* 2003; 51(7): 29.
4. Hainerová IA. *Dětská obezita.* Praha: Maxdorf; 2009. 114.
5. Baráková A et al. Nadhmotnosť a hypertenzné hodnoty TK v 11 a 17-ročnej populácii SR v roku 2009, http://www.nczisk.sk/Documents/nzr/prezentacie/nadhmotnost_hypertenzne_faktory.pdf (cit. 2018.01.21).
6. Kožuchová M, Bašková M. Sledovanie televízie vo voľnom čase v populácii školskej mládeže v oblasti stredného Slovenska. *Kontakt.* 2014; 16(3): 205–210.
7. Šimurka P. Rizikové faktory aterosklerózy v detskom veku. *Pediatrica pre prax.* 2010; 11(5): 197–201.
8. Weiss R, Carcio S. The metabolic consequences of childhood obesity. *Best Pract Res Clin Endocrinol Metab.* 2005; 19: 405–419.
9. Kohler MJ, Thormaehlen S, Kennedy JD et al. Differences in the association between obesity and obstructive sleep apnea among children and adolescents. *J Clin Sleep Med.* 2009; 15, 5(6): 506–511.
10. Marinov Z, Pastucha D. Komplexní metabolické změny u obézních dětí. *Pediatrica pro praxi.* 2012; 13(1): 12–15.
11. Chromá O, Tohrajzlerová I, Čiljaková M, Javorková J, Bánovčin P. Nefarmakologická liečba obezity a nadváhy u detí a adolescentov. *Pediatrica. Bratislava.* 2008; 3(6): 352–355.
12. Feketeová I. Obezita detí a mládeže – problém súčasnej doby, <http://www.zzz.sk/?clanok=11577> (cit. 2017.01.21).
13. Pařízková J, Hills AP. *Childhood obesity. Prevention and treatment.* 2nd ed. London: CRC Press; 2005.
14. Mamun AA, O'Callaghan M, Callaway I. Associations of gestational weight gain with offspring body mass index and blood pressure at 21 years of age: evidence from a birth cohort study. *Circulation.* 2009; 119: 1720–1727.
15. Lisá L. Obezita v detském věku. *Nevoral J. a kol. Výživa v detském věku. Jinočany: HaH;* 2003. 388–396.
16. Dorey E, Roberts V, Maddison R, Meagher-Lundberg P, Dixon R, Ni Mhurchu C. Children and television watching: a qualitative study of New Zealand parents' perceptions and views. *Child: Care Health Develop.* 2010; 36(3): 414–420.
17. Paveleková I, Peterková V. Je školská mládež na Slovensku obézná? In: Řehulka E (ed.). *Škola a zdraví 21. Sociální a zdravotní aspekty výchovy ke zdraví.* Brno: Masarykova univerzita; 2008. 169–178.
18. Liba J, Petrasová A. Stravovacie návyky žiakov mladšieho školského veku vo vzťahu k zdraviu 2. konferencie Škola a zdraví 21. Brno: Masarykova univerzita; 2006. 1–6.
19. Hills AP, Andersen LB, Byrne NM. Physical activity and obesity in children. *Br J Sports Med.* 2011; 45(11): 866–870.
20. Michálek J. *Deti a obezita. Klinická obezitológia.* Brno: Facta Medica; 2013. 284–288.

21. Šimonová B, Vladovičová N. Pohybová aktivita detí vo voľnom čase. Telesná výchova – prostriedok vytvárania vzťahu mladej generácie k pohybu a športu: 1. ročník vedeckej konferencie [CD-ROM]. Zvolen: Technická univerzita vo Zvolene; 2010. 147.
22. Crespo C, Zanotti C, Morga A, Currie D, de Looze M, Roberts CH et al. Social determinants of health and wellbeing among young people. Health Behaviour in School-aged Children (HBSC) study: international report from the 2009/2010 survey. Copenhagen: WHO Regional Office for Europe; 2012.
23. Mihál V. Dáme AHOY (atherosclerosis, hypertension, obesity of the young) dětské obezite? *Pediatric pro praxi*. 2003; 3: 161–3.
24. Kožuchová M, Bašková M. Vybrané faktory životného štýlu vo vzťahu k nadhmotnosti v populácii školskej mládeže. *Kontakt*. 2015; 17(3): 163–167.
25. Fialová J. Výzkum vlivu reklamy na stravovací návyky dětí. Řehulka E (ed.). *Škola a zdraví – Výchova ke zdraví: mezinárodní zkušenosti*. Brno: Masarykova univerzita; 2011. 363–372.
26. Caroli M, Argentieri L, Cardone M et al. Role of television in childhood obesity prevention. *Int J Obes Relat Metab Disord*. 2004; 28(3): 104–108.
27. Lobstein T, Jackson Leach R. Estimated burden of paediatric obesity and co-morbidities in Europe. Part 2. Numbers of children with indicators of obesity-related disease. *Int J Pediatr Obes*. 2006; 1(1): 33–41.

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