Various periods of obesity risk among children and adolescents

Różne okresy zagrożenia otyłością wśród dzieci i młodzieży

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Wstęp. Poprawa zdrowia dzieci i młodzieży jest jedną z najważniejszych wytycznych programów Unii Europejskiej. Od 1998 WHO traktuje otyłość jako światową epidemię. Z badań wynika, że 155 milionów dzieci cierpi na otyłość – w tym 22 miliony poniżej 5 roku życia, a 33 miliony w wieku 6-17 lat. W Polce dzieci otyłe w wieku 1-6 lat stanowią 8% populacji dzieci. U co 12 dziecka występują problemy związane z otyłością, takie jak brak aktywności fizycznej, niskie spożycie warzyw i owoców, podjadanie między posiłkami, nadmiar tłuszczów i cukrów prostych w diecie.

Cel. Wykazanie różnych okresów ryzyka otyłości u dzieci i młodzieży, w aspekcie etiologii i epidemiologii.

Opis. Artykuł przedstawia etiologię otyłości, z uwzględnieniem predyspozycji genetycznych i ontogenetycznych oraz środowiskowych i behawioralnych. Opisano również okresy w życiu dzieci szczególnie sprzyjające otyłości. Epidemiologia otyłości jest istotna w populacji dzieci i młodzieży.

Wnioski. Poprawa zdrowia dzieci i młodzieży powinna stać się priorytetem w prewencji otyłości. Poznanie etiologii i epidemiologii otyłości powinno być pomocne. Dużą rolę odgrywa promocja zdrowia i popularyzacja zdrowego stylu życia. Jest to wyzwanie dla wielu specjalistów.

Słowa kluczowe: *otyłość, dzieci, młodzież, etiologia, epidemiologia, okres ryzyka*

Introduction. Seeking improvement of children's and adolescents' health is one of the most important guidelines of the European Union's programs. In 1998 the WHO pronounced obesity to be a worldwide epidemic. From the research it can be concluded that 155 million of children in the world suffer from overweight or obesity – with 22 million under the age of five and 30-45 million between 6-17 years of age. In Poland, obese children between 1-6 years of age constitute 8% of children. Every 12th child shows problems related to overweight, such as lack of physical activity, low consumption of fruit and vegetables, snacking, excess of dietary fat and simple sugars.

Aim. To show various periods of obesity risk among children and adolescents, with focus on etiology and epidemiology.

Description. This paper presents etiology of obesity, with focus on genetic and ontogenetic predispositions, together with environmental and behavioral ones. The periods in children's lives particularly conductive to obesity have also been described. The epidemiology of obesity has as well become important in the population of children and adolescents.

Conclusion. The improvement of children's and adolescents' health should be a priority in preventing obesity. Getting to know the etiology of obesity as well as epidemiology in this population should be helpful. Health promotion, together with the healthy lifestyle popularization, plays a key role in this aspect. It is a challenge for many specialists.

Key words: *obesity, children, adolescents, etiology, epidemiology, risk period*

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Introduction

Striving to improve the health of children and adolescents is one of the most important guidelines in the European Union programs [1, 2]. Health promotion, along with the awareness of a healthy lifestyle plays a key role here. In Poland as well, the problem of children's and adolescents' health is treated extremely seriously, which is reflected in the list of priorities of the National Health Program [1]. The problem of obesity among children and adolescents has become a challenge not only for pediatricians but also for public health specialists, psychologists, sociologists and educators [3-6].

In 1998, the WHO classified obesity as a non-infectious disease, calling it also an epidemic, which spreads throughout the whole world [2, 7, 8]. In the 21st century obesity has already gotten ahead of AIDS, as well as of malnutrition, which were the main world health problems [7]. The number of obese people is rapidly growing, which is a kind of paradox regarding the promoted cult of slender body in recent years [8]. The pandemic of overweight and obesity encompasses both highly industrialized countries and those with a low national income [8, 9].

From the study of the report of the International Obesity Association in 2004, it appears that 155 million of school-age children (in the world) suffer from overweight or obesity [7]. Among them, 22 million are obese children under the age of five, while the 30-45 million are children aged 6-17 years [7-10].

Unfortunately, the increasing problem of overweight and obesity also applies to Polish children and youth [7, 8]. Lack of physical activity, low consumption of fruit and vegetables, acceptance of snacking, excess dietary fat and sugars cause obesity in 8% of children between 1-6 years of age [3, 7]. These figures are alarming and show that in the near future due to diseases and complications related to excess weight many children could die before their parents [3]. Often the parents themselves do not realize the consequences, and overfeed their children in accordance to the rule "the bigger the healthier" [8]. Excess body weight in children leads primarily to an increased risk of developing chronic diseases such as high blood pressure or lipid management disorders in adulthood [5]. Obese children often are victims of bullying by their peers. They feel isolated, which promotes neurosis and depression [8, 11]

To classify the degree of obesity according to the WHO the following criteria are used: BMI, growth charts, Cole's indicator, fold measurements, and measurement of the circumference of waist and hips [12]. In adults, BMI is one of the parameters used to assess the degree of obesity [12]. According to the WHO, obesity is recognized when the value of the BMI is equal to or greater than 30 kg/m^2 [13-16]. For children, on the other hand, the assessment of the degree of overweight and obesity becomes possible after comparing BMI to the growth charts [8, 15]. In accordance to the guidelines set out by the WHO the overweight in children is recognized when the BMI value is between 85 and 95 centiles, and obesity at the level of 95 centile or above [11, 15, 17, 18].

Treating overweight and obesity in children is a difficult process, because there is no indication what exactly should be done [15]. The rules for healthy eating along with the lifestyle modification should concern not only the child, but the whole family. All kinds of therapies tend to be stressful for both the child and the immediate surroundings [15]. The systematic control of the parameters of child's development seems to be the least stressful preventive action [8]. Not only the parents should take care of the healthy eating habits of their children. Also the school as a teaching facility, where children spend most of their day, should not remain indifferent. School nurses, physical education teachers, through their knowledge and experience in the field of medical aspects of obesity, must become promoters of health in this population group [11, 19].

Purpose

The aim of the study is to provide various periods of obesity risk among children and adolescents with special reference to its etiology and epidemiology.

Etiology of obesity

Obesity is a disorder, which appearance largely depends on the coexistence of both genetic and environmental factors [7, 19].

The fact that the frequency of obesity appearance in the world has rapidly increased can be an indication for the diverse and strong influence of the environment. The gene pool of the global population remains relatively constant, which points at the influence of the external factors [19].

The hypotheses related to the genetic determinants of obesity are based on the concept of mutations of single genes and have been proven only for obesity associated with other genetically-influenced syndromes, in which obesity is one of the symptoms and is not a disorder occurring originally. In such cases, the influence of environmental factors is of secondary importance [19].

Ontogenetic predispositions

Huge changes in midwifery over several years have resulted in treating a fetus as a patient who is diagnosed and treated in the womb [20]. The period of fetal life is extremely important for the development of child's body weight after delivery, and later in life [21]. Test results have indicated that maternal overweight and excessive energy supply in the prenatal period favors the emergence of obesity, increasing the risk of metabolic syndrome, insulin resistance as a result of pancreas damage, high blood pressure and changes in vascular reactivity [21]. A too early introduction of artificial feeding also favors excess of body weight in infants due to an increased protein intake, although the authors' opinions are inconsistent [5, 8, 19, 22].

Genetic predispositions

In spite of intensive research only a few genes that are responsible for the amount of body fat stor-

age and maintenance of energy homeostasis of the organism have been found. The most commonly occurring simple obesity is the result of the influence of unfavorable environmental factors, as well as numerous polymorphisms in various genes determining the tendency to excessive weight gain. There are also rare cases of obesity which is conditioned by mutations in the genes of the leptin-melanocortin pathway, for example congenital leptin deficiency [16, 24]. Defects of other genes may also cause obesity, which however is not the only phenotypic symptom. There have been described more than 30 genetic syndromes, where excess fat is accompanied by mental impairments and specific features of dysmorphic diseases [8]. The most common example of obesity syndrome is *Prader's* and *Willy's* syndrome, which is characterized by the behavioral disorder and massive polyphagia [16].

Genetic determinants of obesity also concern the eating habits characterized by reactivity on the various components of food, food preferences in the family, as well as the way food is consumed. Among obese people the flavor sensitivity is manifested by preference of fatty foods and sweets [19].

Environmental and behavioral determinants

Environmental and behavioral determinants impact, to a considerable extent, the risk of obesity [16]. The main environmental factor which has changed in recent years, is physical activity [16, 19]. Historically, physical activity was part of everyday life, rather than something which is "performed on purpose". The rapid progress of civilization causes more and more automation, which contributes to the decline in physical activity. Children no longer have to go to school on foot or by bicycle since they can safely use public transport or school buses [23]. Emigration of families from the densely populated districts of the city to villages or suburbs, from where the distance to school is considerable, almost forces the use of a car. Computers, TV or game consoles can immobilize children up to 4 hours a day, inducing snacking between meals and irregular eating [19, 23]. Access to food has increased proportionally to the decline of physical activity in children and adolescents, which in modern times has become the subject of a sophisticated and aggressive advertising [16, 18]. Unfortunately, among the most frequently advertised products one can find fast-food type meals, as well as food and beverages, of which the intake should be kept to a minimum (sweets, crisps) [16, 18, 31]. The target group of these ads are, unfortunately, children who have a large influence on the choice of specific food products made by their parents [16]. In many countries there is a common marketing ploy, which suggests buying more unhealthy food products for the price of one.

Also, stores offer large food packages, purchasing which is much more economically favorable than purchasing smaller packages of the same product. Shelves in food stores are specially lighted to seem more attractive, food arrangement on the shelves is forcing the client to look at the whole range of products [16]. The selection of appropriate music and fragrance not only enhances shopping but also makes customers purchase excessive amounts of food. Excessive consumption is the result of such practices [16].

Among the family and social factors affecting the occurrence of obesity the following may be mentioned [16, 25]:

- socio-economic situation of the child;
- level of the child's education;
- material situation in relations to choosing the food products;
- economic factors; place of residence, the marketing activity of the food producers;
- customs, traditions and culture that is cultivated in the given environment.

Psycho-emotional factors also influence the development of obesity in children and adolescents. Stress, lack of acceptance, failures at school, disappointments, failed expectations and conflicts in the family not only cause depressions, but they are also a cause of "escape into food" [8, 19, 25].

Periods especially favoring the occurrence of obesity

Obesity can arise in every period of our lives. In a child's development, there are two periods responsible for the susceptibility to obesity [25]. The first of these periods is age between 0-3 years when the development of adipose tissue occurs mainly by an increase in the number of fat cells. The number of fat cells produced in this period will not decrease later in life. The more the child is nourished, the greater is the content of fat cells, while the more fat cells, the more susceptible the body of a child is to obesity. Obesity as a result of the accumulation of fat cells is very difficult to treat [25].

The second period of being at risk of developing obesity is an early school age which lasts from 7 years of age to puberty. During this period, the body is preparing for a large use of energy, which is associated with puberty, as well as collecting additional stocks of energy [25]. Therefore the child's appetite grows, the amount of fat in the body increases, and the silhouette gets round [25]. During puberty the apparent obesity is fading as a result of the diminished appetite and large energy expenditure. The reason for this is the rapid increase in the body height [25].

Increased appetite characteristic for the early school age can lead to constant overeating. The obesity

formed because of that will not disappear at puberty, because the accumulated stocks of fat far outweigh the increased energy demand. The habit of excessive eating can be so strong that it will stifle the weakening of an appetite, physiologically typical for adolescence [25, 26].

Epidemiology of obesity in the population of children and adolescents

Obesity and overweight among children and adolescents is currently the world-wide problem [7, 10]. According to the IOTF, worldwide there are currently 22 million children under the age of 5 suffering from obesity, and one in 10 children is overweight [10]. The data of the NHANES (National Health and Nutrition Surveys) program from 2003-2004 reported that about 35% of American children aged 6-19 years carried an excess body weight, while 17% were obese [10, 27]. The data presented for children between 2-5 years of age were respectively 26.2% and 13.9%. For boys and girls the highest obesity rates are in the age group of 6-11 years – 19.9% and 17.6% [10]. In groups of children and adolescents there can be observed trends, similar to adults, that indicate susceptibility to overweight and obesity, depending on the ethnic factor. In the first place, there are Mexican-Americans, then blacks and whites [10].

The growth dynamics of overweight and obesity among children and adolescents also applies to European countries. In the early 1980s of the 20th century in 11 European countries, the annual percentage of the increase of this population was 0.5%, while in the 1990s it exceeded 1%. The appropriate indicators for obesity alone accounted for 0.1% and 0.3% [10]. The calculations show that since 2010 in Europe the number of children suffering from overweight and obesity will have increased by 1.3 million/year, where 300 thousand would be obese. By 2010, about 26 million European children were overweight, including 6.4 million who were obese [10].

R. Kelishadi reviewed the prevalence of overweight and obesity in developing countries located on different continents, including Poland (1950-2007). That review indicated high rates of child obesity in Eastern Europe, as well as and in Russia [10]. An example of such a country is Bosnia in which 48.4% of the boys and a 30.8% of girls aged 12-13 years suffer from obesity. The worrisome phenomenon is the coexistence of obesity and malnutrition in children [10]. In the age range from 1-5 years the prevalence of overweight and obesity is much smaller than in the population from 6 to 18 years of life. In the Western Europe the ethnic origin has a significant influence on the development of obesity. For example, in the Netherlands in the survey covering the population aged 0-21 years, including 14 500 native Dutch, 2 900 Turks, and 2 855 Moroccans, it was showed that overweight and obesity was found in the following percentage of boys and girls respectively: Turkish 23.4% and 30.2%, Moroccan 15.8% and 24.5%, and Dutch 8.7% and 11.3% [10].

In Poland in the age group between 1 and 6 years, obesity affects approximately 8% of the children. Every twelfth child has problems associated with excess body weight [3, 5]. A study carried out at the Institute of Food and Nutrition in 2000 on a group of children aged 1-18 years show an increase in the occurrence of excessive weight gain during the toddler period [5, 28].

While reviewing publications regarding obesity it can be noted that in recent years authors pay attention to the faster growth of the prevalence of obesity in rural than in urban areas. This trend regards not only adults, but also children and young people. The observed trend is associated with a change in a lifestyle, which in the last several years has also occurred in the countryside. Rural youth as well as the urban youth spend too much time in front of TV and computer, have bad eating habits, while in rural youth in comparison with their peers from the city have less physical activity. The essential elements influencing the obesity in rural and urban children and adolescents are globalization of the food market along with marketing of food products [29, 30].

A study carried out at the Institute of Mother and Child in 2005 indicated that the percentage of students aged 13-15 years with excess body weight was greater in the city than in rural areas (14.4% and 12.6%), while the percentage of obese people in the city and in the countryside was almost identical at 4.5%. In the countryside there were more overweight boys than in the city, while more obese girls were found in the cities [29, 30].

A study published by K. Sygit in 2010 concerning the lifestyle of obese and overweight children and adolescents from rural areas in Poland showed that overweight was more likely to appear in a group of girls than boys, and obesity was twice more likely to appear in a group of boys than girls [32]. In relation to other countries, in Poland the percentage of overweight and obese youth is not high. The United States are still in the first place, where the percentage is more than three times greater than in Poland. In European countries, in France, excess body weight was found in children twice as often as in their Polish peers [30].

Conclusion

Health problems of children and adolescents should be treated extremely seriously. The improvement of their health is a priority in prevention of obesity. Health promotion, along with the awareness

of a healthy lifestyle play a key role here. Understanding the etiology of obesity, genetics, ontogenetic, environmental and behavioral determinants of obesity, becomes helpful. Obesity is a disorder which largely depends on the coexistence of both genetic and environmental factors. It is also important to know the periods of a child's development particularly conducive to obesity, in order to be able to step in at the right time with the appropriate prevention. It becomes a challenge for pediatricians, public health specialists, psychologists, sociologists and educators.

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