Annals of Agricultural and Environmental Medicine 2013, Vol 20, No 2, 332–340
www.aaem.pl

ORIGINAL ARTICLE

Nutrition-related health behaviours and prevalence of overweight and obesity among Polish children and adolescents

Paulina Wojtyła-Buciora[1], Barbara Stawińska-Witoszyńska[2], Aneta Klimberg[1], Andrzej Wojtyła[1], Małgorzata Goździewska[3], Krzysztof Wojtyła[4], Jacek Piątek[5,6], Cezary Wojtyła[7], Marian Sygit[8,9], Iwona Ignyś[10], Jerzy T. Marcinkowski[11]

[1] *Department of Mother and Child Health, University of Medical Sciences, Poznan, Poland*
[2] *Department of Epidemiology, Chair of Social Medicine, University of Medical Sciences, Poznan, Poland*
[3] *Department of Health Informatics and Statistics, Institute of Rural Health, Lublin, Poland*
[4] *State Higher School of Vocational Education, Kalisz, Poland*
[5] *Department of Physiology, University of Medical Sciences, Poznan, Poland*
[6] *Department of Allergology and Environmental Hazards, Institute of Rural Health, Lublin, Poland*
[7] *Institute of Hematology and Transfusion Medicine, Warsaw, Poland*
[8] *Department of Health Education, University of Szczecin, Poland*
[9] *Institute of Rural Health, Lublin, Poland*
[10] *Children Department of Gastroenterology and Metabolic Diseases, Poznan University of Medical Sciences, Poznan, Poland*
[11] *Department of Higiene, Chair of Social Medicine, University of Medical Sciences, Poznan, Poland*

Wojtyła-Buciora P, Stawińska-Witoszyńska B, Klimberg A, Wojtyła A, Goździewska M, Wojtyła K, Piątek J, Wojtyła C, Sygit M, Ignyś I, Marcinkowski JT. Nutrition-related health behaviours and prevalence of overweight and obesity among Polish children and adolescents. Ann Agric Environ Med. 2013; 20(2): 332-340

Abstract

Introduction. An adequate mode of nutrition is among the most important environmental factors affecting the development of Man and maintenance of a good health status. An improper selection of nutrients and irregular consumption of meals may lead to overweight and obesity.

Objective. The characteristics of health behaviours of the examined population of schoolchildren, with consideration of nutrition and body weight disorders. A comparison of the opinions of schoolchildren and their parents concerning health behaviours. Development of guidelines for educational programmes carried out in the place of residence of the population of schoolchildren and their parents.

Materials and method. The survey covered a randomised group of schoolchildren attending elementary and secondary schools in the Kalisz Province and province of the city of Kalisz. The study was conducted in May and June 2009, in a randomly selected representative group of 1,100 boys and girls from classes V and VI of elementary schools, and 1,100 secondary school adolescents aged 16–19 and their parents. The studies of schoolchildren attending elementary and secondary schools were compared with the all-Polish studies of junior high school adolescents in the school year 2006–2007.

Results. The respondents most often consumed 3–4 meals; however, as many as 26% of junior high school adolescents and 27% of secondary school adolescents admitted that they consume only one meal daily. The schoolchildren show inadequate nutritional habits concerning an insufficient consumption of fruits, vegetables and fish, in favour of high calorific meals and sweet snacks and drinks. Parents improperly assess the body weight of their children and perceive them as slimmer, which is not confirmed by the BMI value for age and gender.

Conclusions. Systematic monitoring and analysis of changes in the health behaviours of adolescents should be a basis for planning health education and promotion programmes. Educational programmes concerning various aspects of health should be implemented in an organized and complementary way, directed not only at schools, but also at entire families and local communities. Knowledge, beliefs, skills and attitudes towards health acquired during the period of adolescence decide about life style in adulthood.

Key words

nutrition, overweight, obesity, adolescents, school

INTRODUCTION

An adequate mode of nutrition is among the most important environmental factors affecting human development and maintenance of good health status [1]. It consists in the systematic provision of indispensable nutrients and energy for the body. A long-term lack of energy balance between the amount of energy introduced to the body in the form of consumed food products and the amount of energy utilized by the body for basic everyday functioning. A simultaneous excess of the energy supplied, leads to the development of overweight and obesity [2].

Obesity is a serious health problem in economically developed countries; it is therefore considered by the World Health Organization (WHO) as a contemporary global epidemic. Epidemiological data show that in 2015 there will be 2.3 billion overweight people worldwide, including 704 million who will be obese. This is associated with the phenomenon of inhibition of the trend towards increased average life span [3]. This problem concerns primarily adults;

Address for correspondence: Paulina Wojtyła-Buciora, Poznan University of Medical Sciences, Departament of Hygiene, 5C Rokietnicka, 60–806 Poznan, Poland
e-mail: paulinawojtyla@gmail.com

Received: 29 November 2012; accepted: 10 January 2013

however, in recent decades, a rapid increase has been observed in the incidence of overweight and obesity in children and adolescents. Based on statistics, it may be presumed that the majority of obese adults were overweight or obese in their early youth. The 2007–2011 report by the International Obesity Task Force (IOTF) shows that every fifth child in Europe has problems with maintaining normal body weight.

In Poland, approximately 20% of adults and 10% of the population of children and adolescents suffer from health problems due to obesity. Therefore, an analysis of the state of nutrition and frequency of occurrence of these abnormalities in adolescents is important in order to maintain a good health condition in adulthood [4, 5].

In recent years in Poland, an unsatisfactory situation has been observed with respect to many aspects of nutrition among children and adolescents. The diets of the young generation are frequently inadequately balanced, with an excessive consumption of high calorie food products, exceeding the daily energy expenditure, with a simultaneous low content of proper nutrients for the body, with relation to the demand for these nutrients. An inadequate mode of nutrition in early youth may lead to many chronic metabolic-civilisation diseases. Excessive consumption of animal fats by growing adolescents increases the risk of cardiovascular diseases [6, 7], including ischemic heart disease, gastrointestinal diseases and gallstones. In addition, such disorders as hyperlipidemia, arterial hypertension and carbohydrate metabolism disorders manifest themselves especially in individuals with abdominal obesity, often with the diagnosis of polymetabolic syndrome, which ultimately leads to type 2 diabetes. People who have a Body Mass Index (BMI) higher than 35 kg/m^2, are at a 20-fold higher risk of development of type 2 diabetes, compared to those with a normal BMI [8, 9]. The risk of development of metabolic syndrome is by 50% higher in children and adolescents who are obese, compared to those possessing a normal body weight [10]. It has also observed that obesity in girls aged 9–10 predisposes to the occurrence of metabolic syndrome as early as at the age of 18 [11].

British studies show that the lowest risk of type 2 diabetes and cardiovascular diseases occurs while maintaining body weight on the level of the BMI within the range 20–23.9 kg/m^2 [12]. In these studies, a linear relationship was confirmed between the risk of cardiovascular diseases and the BMI value.

Obesity increases the risk of many types of cancer, including those most commonly occurring, such as breast cancer at postmenopausal age [13], prostate cancer in males [14], cancer of the endometrium, kidney, oesophagus, and colon [15]. Based on literature [2], a greater predisposition to cancer is noted among obese individuals who, in the childhood, supplied with food an excessive amount of energy to their bodies. This fosters the development of large organs with a large number of cells, and consequently increases the risk of their pathological divisions leading to the development of cancer. In adults, an excess favours the division of cells of the mucous membranes and development of various types of cancer. In the case of hormone-dependent cancer, an excess of estrogens released from the overgrown fatty tissue affects their development.

Considering an increasing percentage of adolescents with overweight and obesity, a constant, precise monitoring of the situation in this respect is an important public health issue worldwide. Thus, it is important to apply a comparable, generally mandatory standard for the measurement of the body weight of children and adolescents. Therefore, at this age, anthropometric measures and the Body Mass Index (BMI) are applied to evaluate the content of fatty tissue. The BMI is the simplest test for the assessment of body weight with relation to body height, by comparison with the standard adequate for age and gender. The indicator of relative body weight is recommended by the WHO, IOTF and the National Programme for the Prevention of Overweight, Obesity and Chronic Non-Infectious Diseases by Improvement of Nutrition and Physical Activity (POL-HEALTH), carried out in Poland by the Institute of Health and Nutrition. For the evaluation of the state of health of adults the WHO proposed uniform, common criteria applied worldwide (Tab. 1) [16]. The BMI in children and adolescents changes in the course of growing up [17, 18, 19]; therefore, in the studies concerning the measurement of body weight, appropriate standards are applied, designed for an individual country, in the form of tables and percentile networks, taking into consideration the respondents' gender and age. Patterned on standards for adults, the IOTF proposed limits with respect to percentiles appropriate for children and adolescents [20, 21]. Percentile networks developed by Cole guarantee the comparability of the studies conducted.

OBJECTIVES

1. Characteristics of health behaviours of the population of schoolchildren examined with consideration of nutritional and body weight disorders.
2. Comparison of opinions of the examined schoolchildren and their parents concerning health behaviours.
3. Development of guidelines for educational programmes carried out in the place of residence of the population of schoolchildren examined and their parents.

MATERIALS AND METHOD

The survey covered a randomised group of children and adolescents attending elementary and secondary schools in the Province of Kalisz and the province of the city of Kalisz. The study was conducted in May and June 2009 among a randomly selected representative group of 1,100 boys and girls from classes V and VI of elementary schools, and 1,100 secondary school adolescents aged 16–19, and their parents. The research instrument was a questionnaire form designed by the Chief Sanitary Inspectorate, designed separately for schoolchildren who attend elementary and secondary schools. The questionnaire items were directed not only to the Kalisz schoolchildren, but also to their parents, in order to obtain (by comparing the replies by children and their parents) more reliable data concerning the selected health promoting behaviours, and anti-health behaviours undertaken by the respondents. The study was conducted on the level of the province, after making agreements with the Department of Education of the Municipal Office in Kalisz, the Alderman of Kalisz Province and the Officer for Education Welfare in Poznań. At the local level, the cooperation included local commune offices in the areas where there were classes participating in the study.

For the purpose of the survey, the sample was selected by two stage sampling: at the first stage a school was selected,

while at the second stage – a class. The sample was of a cluster character, i.e. in the selected class were qualified those schoolchildren who had completed an anonymous questionnaire form. While selecting a school for the study the following criteria were considered: class, province, and commune. The sample of schoolchildren was selected from among schools and facilities listed in the database of the Ministry of National Education of 30 September 2008, which was the sampling frame. At the first stage of selection, the scope of the list was limited to two types of schools (rural elementary schools, and those located in the city of Kalisz), and subsequentl,y schools were selected using the procedures of the statistical systems Statistica and SPSS.

The study was conducted during weekly class meetings, they were voluntary and anonymous. The questionnaire forms designed to be completed by parents were taken home by the schoolchildren in sealed envelopes, and after their completion collected on a selected day by the individual class tutor. The following number of questionnaires were collected:

- 846 schoolchildren from classes V and VI of elementary schools, and 1,018 secondary school adolescents; the return rate was 77% and 92%, respectively
- 708 parents of children from elementary schools, and 670 parents of secondary school adolescents; the return rate was 64% and 61%, respectively.

From among the questionnaire forms collected the following were qualified for further studies:

- 819 schoolchildren attending elementary schools and 999 secondary school adolescents, which constituted 74% and 91% correctly completed questionnaires, and
- 688 parents of children from elementary schools and 667 parents of secondary school adolescents, which constituted 62% and 61% of correctly completed forms, respectively.

Blank questionnaire forms and those completed by respondents in less than 50% were not qualified for the study.

The questionnaire data in paper form were introduced to the central database with the use of an integrated system of survey data introduction and collection. Subsequently, the data collected were subject to statistical analyses. These analyses were performed using the STATISTICA programme. The significance of the statistical relationship between variables was tested by means of the χ^2 Pearson test, investigating independence of m≥2 nominal variables. Verification of the test consisted in calculating the value of the χ^2 function and comparing it with numerical values of this function postulated by the null hypothesis, and assuming the probability of error p=0.05, p=0.02, p=0.01 or p=0.001.

The study of schoolchildren attending elementary and secondary schools was referred to the all-Polish studies of schoolchildren attending junior high schools during the school year 2006–2007, in order to diagnose problems related with nutrition and occurrence of overweight and obesity among Polish adolescents in various age groups. The all-Polish study covered a population of 1.5 million (1,494,153) boys and girls from junior high schools. The research instrument was a questionnaire form designed by the Chief Sanitary Inspectorate, patterned on the questionnaire used in the Global School-base Student Health Survey (GSHS) studies. As a result of the survey, 9,360 correctly completed questionnaire forms were obtained from adolescents attending junior high schools and 6,951 from their parents. The survey was carried out by the surveyors from health education agencies of the State Sanitary Inspectorate in individual provinces. The procedures for sampling, introduction of data and statistical analysis was the same as in the studies of adolescents from the Kalisz Province and the City of Kalisz.

RESULTS

Approximately 70% of adolescents in the study ate first breakfast every day. Among junior high and secondary schools adolescents everyday breakfast consisted of bakery products, butter, eggs, cold meats and cheese (Tab. 1); 86% of schoolchildren attending elementary schools consumed a second breakfast at school. In the case of junior high and secondary school adolescents, this percentage was 50% and 59%, respectively, and their second breakfast most often consisted of sandwiches, a yeast bun and fruits. Nevertheless, it is noteworthy that approximately 22% of respondents consumed sweets. The parents in the survey in most cases confirmed the frequency of consumption of the first and second breakfast (Fig. 1).

The meal most often consumed by respondents during the day was lunch, while a tea-time snack was most rarely

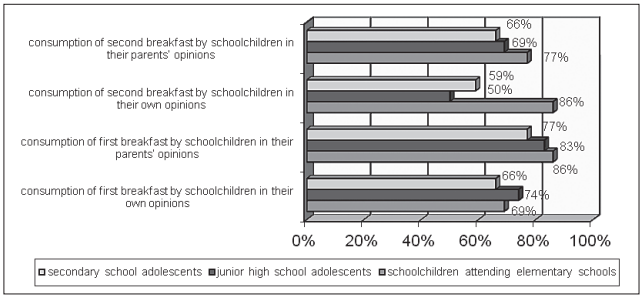

Figure 1. Frequency of consumption of the first and second breakfast in opinions of schoolchildren and their parents.

Table 1. Types of products most frequently consumed for the first and second breakfast by adolescents attending junior high and secondary schools.

Products consumed for first breatfast	Adolescents attending junior high schools	Adolescents attending secondary schools	Products consumed for the second breakfast	Adolescents attending junior high schools	Adolescents attending secondary schools
	%	%		%	%
bakery products	74.4	76.5	sandwich	74.7	85.2
butter	66.0	69.7	yeast bun	56.3	51.1
cold meats	37.3	35.0	fruits	47.2	44.9
cheese	15.8	10.5	yogurt	22.4	31.5
milk soup	26.1	15.3	sweets	22.2	22.8
eggs	65.3	71.8	tea	16.8	9.2
yogurt	14.7	10.2	crisps	13.3	4.7

consumed (Fig. 2). West European style: breakfast (Poland – 2nd breakfast), lunch, tea, dinner, supper. The most popular dishes selected for lunch by adolescents were white meat, potatoes, salads, soups and products made of flour (Tab. 2). The tea-time snack consisted mainly of fruits, cakes and sweets (Tab. 3). Nearly 70% of adolescents ate supper (Fig. 2), which consisted basically of sandwiches and warm dishes (Tab. 3). A discrepancy was observed between the replies provided by the schoolchildren and their parents, with respect to the consumption of supper and tea-time snack. In parents' opinions, these meals were consumed by their children more rarely than reported by the children.

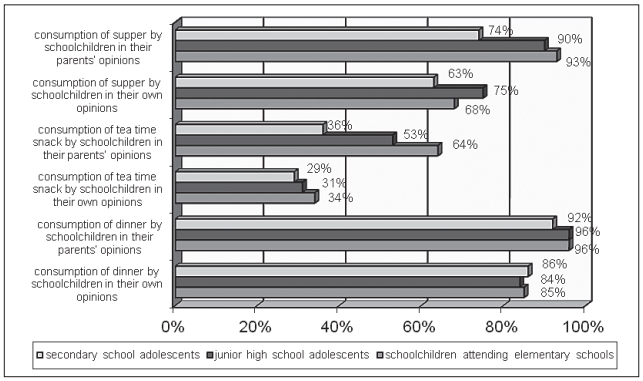

Figure 2. Frequency of consumption of lunch, tea-time snack and supper in opinions of schoolchildren and their parents.

Table 2. Types of products most frequently consumed for lunch by junior high and secondary school adolescents.

Products consumed for lunch	Adolescents attending junior high schools	Adolescents attending secondary schools
	%	%
white meat	86.9	87.4
potatoes	91.7	87.4
salads	83.5	87.3
soup	85.5	81.3
products made of flour	70.6	62.3
rice	48.5	49.8
red meat	47.3	46.6
cereals	28.7	24.2

As many as 78% of junior high school adolescents and 77% of secondary school adolescents snacked during the day. They usually consumed fruits, sweets, yogurt and cakes (Fig. 3).

Schoolchildren from elementary schools were not considered in the above-presented Tables showing the types of products consumed for individual meals, because the questionnaire form designed for them was slightly different from that for junior high and secondary school

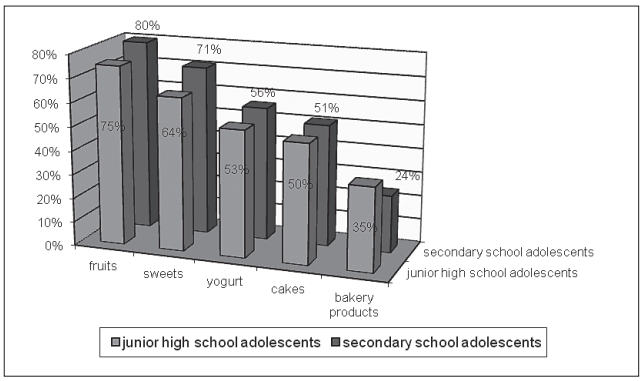

Figure 3. Percentage of junior high and secondary school adolescents snacking between meals.

adolescents. Schoolchildren attending elementary schools were generally asked about the frequency of consumption of fruits, vegetables, milk and dairy products, sweets, fish, dark bread, salty snacks, sweetened beverages and water.

Analysis of products consumed by schoolchildren from elementary schools showed that 48% of them consumed milk and dairy products, and drank milk every day (Fig. 4).

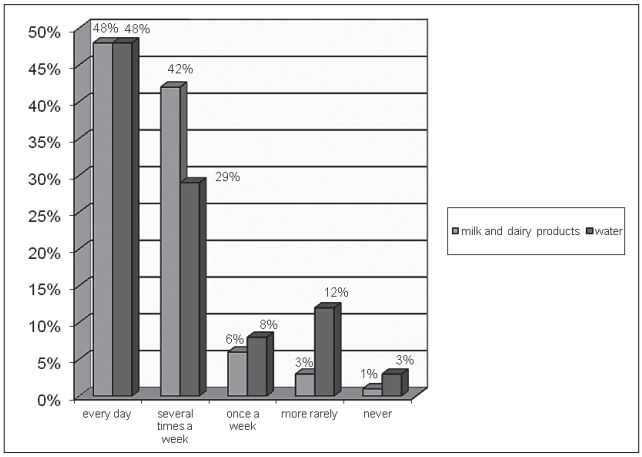

Figure 4. Frequency of consumption of milk and dairy products, and water by schoolchildren attending elementary schools.

Analysis of the questionnaire data indicated that only 35% of schoolchildren regularly consumed fruits and vegetables. The same percentage of respondents reported that they ate fish once a week and 23% of them consumed dark bread equally frequently (Fig.5).

The schoolchildren consumed definitely too frequently – every day or several times a week – sweets and sweet beverages – 74%, whereas 48% of schoolchildren eat salty snacks several times a week (Fig.6). These products were also most often selected while shopping in school shops (Tab. 4).

Table 3. Type of food products most often consumed for tea time snack and supper by junior high and secondary school adolescents.

Products consumed for tea time snack	Adolescents attending junior high schools	Adolescents attending secondary schools	Products consumed for supper	Adolescents attending junior high schools	Adolescents attending secondary schools
	%	%		%	%
fruits	75.2	75.0	sandwiches	88.3	90.6
cakes	48.3	49.1	warm meals	39.6	32.9
sweets	40.7	48.1	tea	68.7	78.0

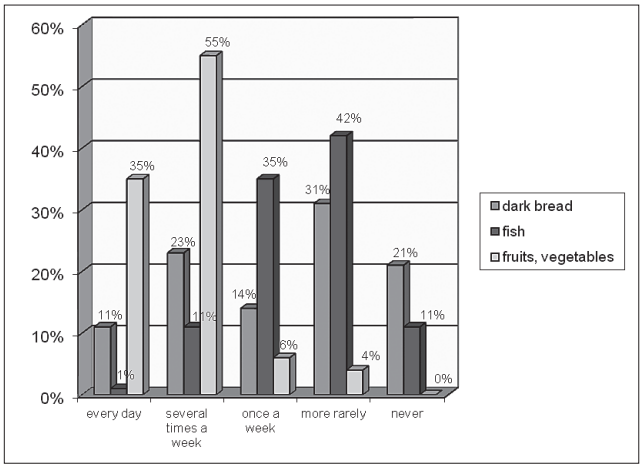

Figure 5. Frequency of consumption of fruits and vegetables, fish and dark bread by children attending elementary schools.

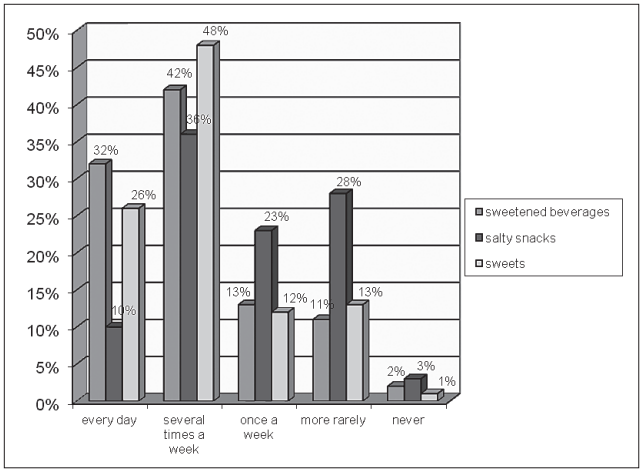

Figure 6. Frequency of consumption of sweets, sweetened beverages and salty snacks by schoolchildren attending elementary schools

Table 4. Type of products most frequently bought in school shops by schoolchildren attending elementary schools.

Products bought in school shops	%
sweets	41.3
yeast buns/doughnuts/croissants	39.2
crisps	19.8
ice cream/desserts	18.0
beverages	16.0
fast-food	9.5
fruits	9.2
sandwiches/rolls	7.3

According to the principles of rational nutrition, the respondents should consume 5 meals daily. Only 58% of schoolchildren from elementary schools fulfilled this requirement. Adolecents from junior high and secondary schools most often consumed 3 meals daily (Fig.7). This may evidence bad nutritional habits of the schoolchildren and their families. While comparing the responses by schoolchildren and their parents it should be presumed that parents are convinced about more frequent consumption of meals by their children (Fig.8).

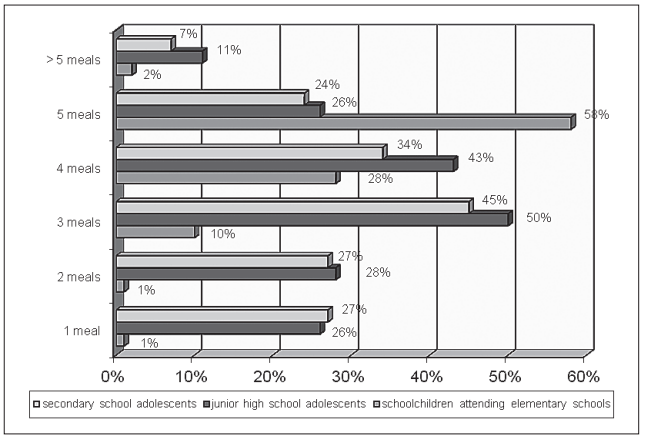

Figure 7. Number of meals consumed daily in opinions of schoolchildren attending elementary, junior high and secondary schools.

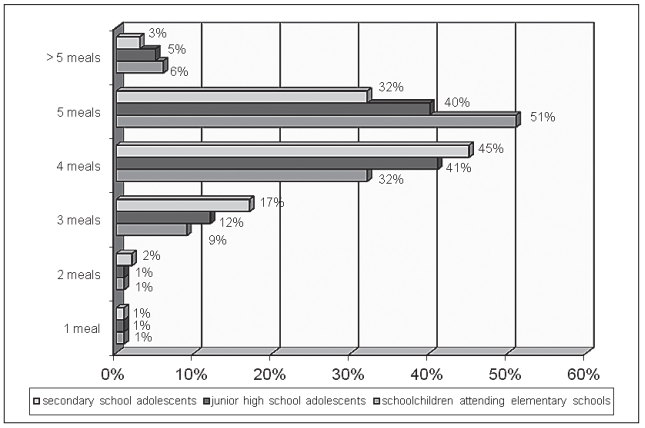

Figure 8. Number of meals consumed daily in opinions of parents of schoolchildren attending elementary, junior high and secondary schools.

Sweets were the preferred products most often indicated by secondary school adolescents. The consumption by schoolchildren of high calorie products in the form of snacks causes the feeling of being full, which is associated with omitting fully valuable meals. This may also lead to problems with maintaining normal body weight and, in consequence, to nutritional disorders related with overweight and obesity. It is also an alarming fact that high calorie meals of the fast-food type, e.g. spaghetti, lasagne, pizza, are most preferred among junior high and secondary school adolescents (Tab. 5).

At the time of conducting the survey, nearly 80% of schoolchildren from the Land District and the province of the City of Kalisz had a normal body weight. Obesity occurred in approximately 6% of respondents. The greatest problems with overweight were found among the youngest schoolchildren – those attending elementary schools (Fig. 9).

The Body Mass Index for adolescents aged 17–18 was calculated with reference to the methodology of percentile networks recommended by the WHO, and adjusted to the Polish conditions by the Institute of Mother and Child. With respect to adolescents aged 19, the BMI was calculated according to the following formula:

$$BMI = \text{body weight} / \text{body height}^2 \ [kg/m^2]$$

The calculations of the BMI were based on the values concerning body weight and height reported by the respondents.

Table 5. Meals most preferred and most frequently indicated by schoolchildren attending elementary, junior high and secondary schools.

Preferred meals	Schoolchildren attending elementary school	Preferred meals	Adolescents attending junior high schools	Adolescents attending secondary schools
	%		%	%
Sweets	41.3	soup	33.8	28.1
yeast buns doughnuts croissants	39.2	lasagne/spaghetti	22.5	22.3
Crisps	19.8	pizza	34.0	20.9
ice cream/ desserts	18.0	dairy products	11.7	19.8
sweetened beverages	16.0	poultry	12.6	18.4
fast-food	9.5	pork chop/ meat patty	22.5	18.0
Fruits	9.2	pancakes / omlete	17.1	17.2
sandwiches/ rolls	7.3	dumpling	15.2	15.4
Yogurt	4.7	salads	7.1	13.2
Pizza	4.2	sweets, cakes, desserts	6.8	12.1
Juices	4.2	fruits	9.7	11.6
french fries	2.0	vegetables	9.7	10.2

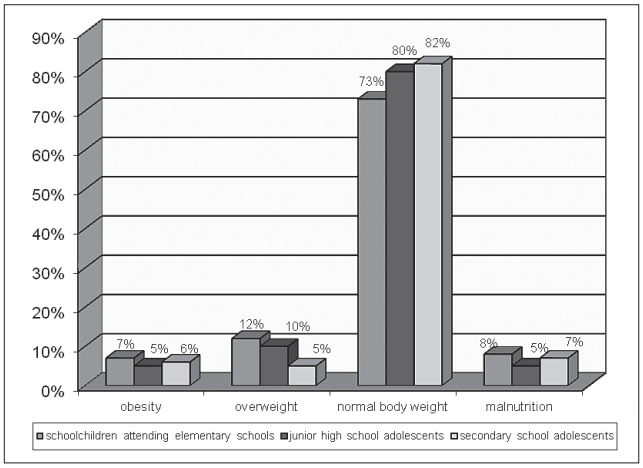

Figure 9. Evaluation of body weight by schoolchildren attending elementary, junior high and secondary schools.

Parents incorrectly assessed their children's body weight, and perceived them as slimmer, which was not confirmed by the BMI values for age and gender (Fig. 10).

DISCUSSION

The mode of nutrition, especially during the period of rapid changes taking place in the body in adolescence, exerts an effect on the course of the final growing-up process and the maintenance of normal body weight. The health consequences resulting from irrational nutrition are abnormal physical and mental development, as well as an increase in susceptibility to selected diseases, a decrease in body efficacy, and shortening of the life span. In the case of adolescents, the frequency of consumption of food products during the day plays an

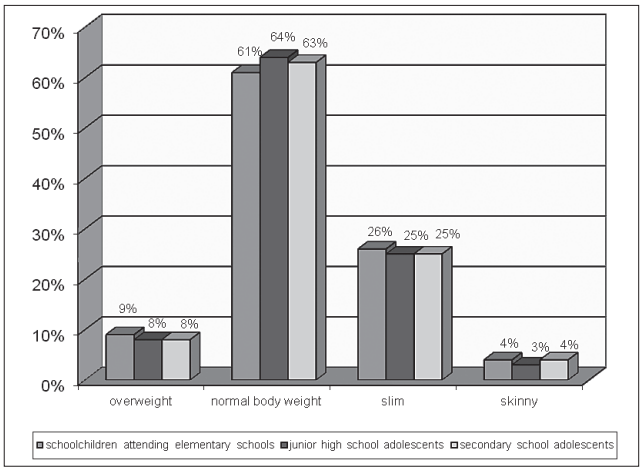

Figure 10. Evaluation of body weight of schoolchildren attending elementary, junior high and secondary schools in opinions of their parents.

important role in the process of body mass regulation [22]. With a regular consumption by adolescents of 5 meals during the day, the organism gets used to the constant supply of an optimum dose of energy and nutrients, which are properly managed. The allowable breaks between meals should not exceed 3–4 hours. Then, the organism does not have to prepare itself for longer breaks awaiting fully valuable food products, and therefore does not store excessive reserves. The correct distribution of meals during the day has a positive effect on carbohydrates metabolism, especially the levels of glucose and lipids in blood, body weight and contents of the fatty tissue. Irregularity of meals may cause a deficiency of some nutrients, as well as decrease in energy expenditure by the body. Those who consume meals irregularly have lower thermogenesis, are exposed to a positive energy balance which, in turn, leads to the increase in body weight [23].

According to the Institute of Food and Nutrition in Warsaw, approximately 10–20% of schoolchildren mention that they do not consume first breakfast before going to school. Studies conducted by Kasperczyk et al. [24] and Malara et al. [25] report that only 70% of adolescents consume first breakfast. This relationship is confirmed by own studies which show that that nearly 70% of schoolchildren during the school days consume morning breakfast, while according to their parents this group is approximately 80% of secondary school adolescents in the survey. Teenagers who do not eat at home in the morning compensate the omitted time of energy supply by consumption of an even greater amount later during the day [26, 27]. Canadian researchers indicate the beneficial relationship between the regular consumption of first breakfast and the occurrence of overweight and obesity – in both boys and girls [28]. They confirmed that the ingestion of the morning breakfast is associated with supplying the body with a greater amount of energy originating from whole wheat bread and dairy products [29]. Considering the above, it should be stated that the junior high and secondary school adolescents in the study show certain nutritional abnormalities, because they, and also their parents, admit that the food products most often consumed for breakfast are: white bread, butter, cold meat and cheese. The ingestion of dark bread, starting from the youngest age group, is a rare phenomenon. Only 11% of schoolchildren attending elementary schools consume cereal products which are the main source of fibre. An excessive consumption of

fat in Poland is observed as early as in childhood, then in adolescence, and increasing with age. Especially risky health behaviours concern a high contribution of saturated (animal) fats, and an insufficient consumption of unsaturated (plant) fats. Despite the fact that after 1990 the consumption of animal fats decreased to the benefit of polyunsaturated fat, butter still remains the major fat used for spreading on bakery products (66% of junior high adolescents and 70% of secondary school adolescents). The sources of saturated fats are also full-fat dairy products, i.e. full fat milk, cream, full-fat cheese, or cream yogurts and desserts based on cream.

Adolescents who skip first breakfast show a lower tendency towards physical activity, which is manifested by a quicker weight gain, compared to their contemporaries who observe the principles of adequate consumption of meals at precisely specified times during the day [30]. Similar relationships were obtained in American studies, where adolescents with the same BMI were provided food products with the same calorific value, with the weekly, equivalent time designed for performance of physical exercises. It was confirmed that more frequent consumption of meals, especially regular eating of breakfast at home, prevents the development of overweight and obesity, especially in girls during the period of adolescence [31, 32, 33].

Teenagers, when they depart from home to go to school, spend a considerable part of the day there. Thus, it is recommended that schoolchildren who spend up to 6 hours a day at school should be provided with fully valuable meals, i.e. a second breakfast or a warm dish, and it is an alarming fact that only 50% of junior high adolescents and 59% of secondary school adolescents consume second breakfast at school, which completes the energy and nutrients lost during the day. An unsatisfied feeling of hunger results in worse concentration, irritation, decreased capability for acquisition of knowledge, and reduced physical and mental efficacy during school classes. Many studies conducted in schools worldwide, where special breaks are organized with the possibility of consumption of meals by children and adolescents, show that these schoolchildren more actively participate in lessons. They also have better concentration and memory while performing specified tasks, and achieve better educational results in such subjects as mathematics and geography [34, 35, 36]. While staying in school, adolescents willingly use food products offered by school shops which, however, do not provide the daily demand for nutrients. The food products most frequently bought by them are: crisps, chocolate bars, and sweet fizzy beverages. These products suppress the feeling of hunger, but have a high energy value from carbohydrates and saturated fats [27]. In this way, sweet fizzy beverages replace the juices and milk drinks adequate for health, resulting in a lower consumption of calcium and vitamin C [37, 38]. The deficiency of calcium in the diet of girls and boys aged of over 10, when they are at the phase of rapid growth and the demand for this element is increased, is especially dangerous. Highly sweetened beverages also contain a large amount of phosphates, which may increase the risk of the development of ostheoporosis in adulthood.

Evaluation of the mode of nutrition carried out in 2011 by the State Sanitary Inspectorate shows that the abnormalities most frequently observed in the collective nutrition of children and adolescents is an excessive consumption of fats, sugar, potatoes, in some cases, drastic deficiencies in the consumption of fruits, vegetables, milk and dairy products, butter and eggs [39]. This is confirmed by own studies which show that the consequence of the above-mentioned situation are nutritional abnormalities among adolescents in the form of insufficient consumption of fruits and vegetables in the daily diet, and excessive consumption of fats and sweets.

It is therefore necessary within the educational pathway of health-promoting education that the attitude is shaped among adolescents for their mode of nutrition, facilitating conscious selection of food products. This problem also concerns the organizers of collective nutrition in schools, who frequently show low awareness of the role of nutrition in the psycho-physical development of adolescents. Therefore, while planning and carrying out collective nutrition in schools it is necessary to disseminate model food portions by, e.g. designing menus with the recommended nutritional value of individual products, in order to provide adolescents with the greatest possible amount of fully valuable meals.

Analysis of nutritional habits showed that dinner is the meal which is most regularly consumed after return from school, and is consumed by approximately 80% of respondents. Kasperczyk et al. [24] in their studies obtained identical relationships, while Kołoło [40] showed that during school days 70% of secondary school adolescents consume dinner every day, whereas during weekends – 90%. Schoolchildren, to a large extent, resign from the remaining meals, and a part of them do not eat supper. It is noteworthy that the respondents most often consumed 3 or 4 meals; however, as many as 26% of junior high adolescents and 27% of secondary school adolescents claim that they eat only one meal daily. This relationship is not confirmed by their parents; according to them, their children eat 4–5 meals daily, and less than 2% of them consume one meal daily. Studies conducted in the West-Pomeranian Region among junior high school adolescents confirm the above-mentioned relationships. According to these studies, 37% of schoolchildren most often consume 4 meals daily [41]. Slightly more, 4–5 meals daily, are consumed by schoolchildren from elementary schools, which is also reported by their parents. In the age group examined, the omission of meals is more rare. This shows that this phenomenon increases with age.

Adolescents frequently snack in-between meals, in this way supplying the energy necessary for everyday functioning. The results of own studies show that 78% of junior high school adolescents and 77% of secondary school adolescents snack during the day. They usually snack on fruits, sweets, yogurts and cakes. Very similar results were obtained in the studies of adolescents living in the Silesian Region, where 70% of adolescents snacked in- between meals [25].

An interval of at least two-hours between snacks and the obligatory main meals is recommended. The correct distribution of properly balanced meals during the day should consider the selection of nutrients. High calorie meals of the fast-food type belong to the preferred products selected by adolescents. This was also confirmed in own studies of junior high and secondary school adolescents, who most often indicated such meals as: lasagne, spaghetti, and pizza. These meals supply the body with high amounts of saturated fatty acids and trans isomers fatty acids, salt, contain slight amounts of vitamins A, C, D and E, thiamine and fibre. Too frequent consumption of fast-food products by individuals whose diet is not sufficiently varied may lead to the development of vitamin malnutrition, and

subsequently, obesity, which is the cause of many nutrition-related diseases [34].

In addition, own studies show that not only children, but also their parents are not aware of nutritional errors which they commit. Among those which are most prevalent there should be noted: the above-mentioned skipping first breakfast before going to school, and second breakfast at school, irregularity of consumption of meals, and abnormal frequency of consumption of selected groups of food products. It should be noted that nutritional habits acquired at home shape adequate health attitudes in growing adolescents, which are difficult to change in later life [42]. The positive effect of parents on health-promoting behaviours of their children, i.e. an adequate diet, physical activity and prevention of obesity was confirmed in Australian studies [43]. The quality and amount of food products supplied should, therefore, be adjusted to age, gender, body structure, mode of life, properly incorporated in meals, and rationally distributed during the entire day [44]. Rational mode of nutrition started in later life is not able to normalise previously lost nutrients necessary for the efficient functioning of the body and proper physical and mental development of adolescents [34].

According to a WHO report, overweight and obesity are a serious health problem in Europe. It is estimated that in the European Union countries more than 14 million children are overweight (18% of the population of children), including 3 million (4% of the children population) obese [45].

Compared to the 1970s, this percentage is 10 times higher, which was confirmed by many epidemiological studies.

In Switzerland, the percentage of overweight and obesity increased from 4% in 1960 to 18% in 2003, in the United Kingdom – from 8% in 1974 to 20% in 2003, whereas in a selected region of Spain, the percentage of obese 13–14-year-olds doubled within the time interval from 1985–2002 [46, 47]. Comparison of results of the survey conducted within the project Health Behaviour in School-Aged Children (HBSC) in the years 2001/2002 and 2005/2006 indicated an alarming increase in the occurrence of obesity among adolescents of both genders in such countries as: the Czech Republic, Estonia, Latvia, Lithuania, Hungary and Poland [48].

In individual European countries, children and adolescents are characterised by various degree of excessive body weight. Among children aged 0–5 the highest percentage of overweight is observed in the Ukraine (27%) and in Bosnia and Herzegovina (17%). Overweight occurred both in boys and girls in Spain at an early school age (aged 6–9, 35%), and in Portugal (aged 7–9, 31%). An excessive increase in body weight is more rarely noted in Slovakia (aged 7–9, 15%), France (aged 7–9, 18%), Switzerland (aged 6–9, 18%) and Iceland (aged 9, 18%). During the teenage period, obesity is observed in Irish girls (aged 9–12, 27%) and Spanish boys (aged 10–17, 32%). In the Czech Republic, this problem concerns 9% of adolescents aged 14–17.

In 1994–1995 in Poland, population studies were conducted among children and adolescents aged 6–17. Overweight was found in 9% and obesity in 3% of respondents [34].

In 2000, the Institute of Food and Nutrition carried out studies which showed that overweight is observed in 16% of boys and 11% of girls aged 1–18, while obesity in 4% and 3%, respectively [34]. Studies carried out in the years 2005–2006 among Warsaw adolescents during the period of puberty, aged 11–15, showed that 18% of boys and 12% of girls were overweight, and 3% of respondents were obese. While analysing epidemiological data it should be noted that the frequency of occurrence of obesity among Polish children and adolescents increased within 10 years (1995–2005) by 4–6 % [49].

Own studies show that the highest percentage of respondents with overweight is observed among children attending elementary schools – 12%, while the lowest – among secondary school adolescents – 5%. This indicates that schoolchildren, especially girls, pay greater attention to normal body weight. In this way, they want to follow fashion trends and achieve acceptance from their contemporaries. In the presented study, parents underestimated the body weight of their children, which indicated the necessity for educating parents in the area of correct evaluation of body weight.

The above-mentioned analysis shows that the incidence of overweight and obesity among children and adolescents is also a serious problem in Poland. It is commonly assumed that the most effective method of obesity control is the use of a balanced diet, with a simultaneous increase in energy expenditure by regular physical activity [34]. The basic place of imparting knowledge concerning adequate diet in order to prevent overweight is the family, in association with school [50, 51].

SUMMARY

1. Health behaviours of elementary, junior high and secondary school children and adolescents differ from Polish and international recommendations. This may have negative health consequences in later life.
2. Schoolchildren show improper nutritional habits with respect to insufficient consumption of fruits, vegetables and fish, to the benefit of high calorie dishes, sweet snacks and beverages.
3. Parents exert a major effect on dietary and nutritional behaviour of the population examined.
4. The percentage of overweight and obesity among children attending elementary schools is higher than that reported by other observations made in Poland.
5. Parents inappropriately evaluate body weight of their children and perceive them as slimmer, which is not confirmed by the BMI value for gender and age.

CONCLUSIONS

1. Systematic monitoring and analysis of changes in health behaviours of adolescents may constitute a basis for planning health education and health promotion programmes.
2. Educational programmes concerning various aspects of health should be implemented in an organized and complementary way – directed not only to schools, but also entire families and local communities.
3. Knowledge, beliefs, skills and attitudes towards health acquired in adolescence decide about life style in later life.

REFERENCES

1. Story M, Neumark-Sztainer D. School-based nutrition education programs and services for adolescents. Adolesc Med State Art Reviews. 1996; 7: 287–302.
2. WHO Information Series on School Health – Promoting Physical Activity in Schools: An Important Element of a Health-Promoting

School. Geneva, Switzerland. http://www.who.int/school_youth_health/resources/information_series/FINAL%20Final. (access: 23.11.2012).
3. Garrow JS, James WPT, Ralph A. Human Nutrition and Dietetics. Churchill Livingstone, London 2000.
4. Guo SS, Huang C, Maynard LM, et al. Body mass index during childhood, adolescence and young adulthood in relation to adult overweight and adiposity: The Fels Longitudinal Study. Int J Obesity Rel Met Dis. 2000; 24: 1628–35.
5. Whitaker RC, Wright JA, Pele MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. N Engl J Med. 1997; 337: 869–73.
6. The Surgeon General's Report on Nutrition and Health Washington DC: US Public Health Service, Office of the Surgeon General 1988. http://profiles.nlm.nih.gov/NN/Views/Exhibit/documents/public.html (access: 23.11.2012).
7. Szponar-Bojda A, Krasowska D, Pietrzak A, Chodorowska G. Metabolic syndrome in psoriasis. Postep Derm Alergol. 2012; XXIX, 5: 356–362.
8. Brosnahan J, Steffen LM, Little L, Patterson J, Boostrom A. The relation between physical activity and mental health among Hispanic and non-Hispanic white adolescents. Arch Peds Adol Med. 2004; 158(8): 818–23.
9. Willett WC, Dietz WH, Colditz GA. Guidelines for healthy weight. N Engl J Med. 1999; 341: 427–34.
10. Weiss R, Dziura J, Burgert TS, et al. Obesity and the metabolic syndrome in children and adolescents. N Engl J Med. 2004; 350: 2362–74.
11. Morrison JA, Friedman LA, Harlan WR, et al. Development of the metabolic syndrome in children and adolescents. N Engl J Med. 2004; 350: 2362–74.
12. Shaper AG, Wannamethee SG, Walker M. Body weight: implications for the prevention of coronary heart disease, stroke, and diabetes mellitus in a cohort study of middle aged men. BMJ 1997; 314: 1311–7.
13. Morimoto LM, White E, Chen Z, et al. Obesity, body size, and risk of postmenopausal breast cancer: The Women's Health Initiative. Canc Causes Contr. 2002; 13: 741–51.
14. Cerhan JR, Torner JC, Lynch CF, et al. Association of smoking, body mass, and physical activity with risk of prostate cancer in the lowa 65 + Rural Health Study. Canc Causes Contr. 1997; 8: 229–38.
15. McGill HC Jr, Arias-Stellen J, Carbonnell LM, et al. Physical fitness: its contribution to serum high – density lipoprotein. Atherosclerosis 1983; 48: 173.
16. Report of a WHO Consultation. Obesity: preventing and managing the global epidemic. WHO Technical Report Series 894. Genewa WHO, 2000 http://www.who.int/nutrition/publications/obesity/WHO_TRS_894/en/index.html access: 23.11.2012).
17. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey BMJ. 2000; 6, 320(7244): 1240 PMCID: PMC27365.
18. Rolland-Cachera MF, Sempé M, Guilloud-Bataille M, Patois E, et al. Adiposity indices in children. A J Clin Nutr. 1982; 36: 178–84.
19. Cole TJ, Freeman JV, Preece MA. Body mass index reference curves for the UK, 1990. Arch Dis Child. 1995; 73: 25–29.
20. Dietz WH, Robinson TN. Use of the body mass index (BMI) as a measure of overweight in children and adolescents. Arch Peds Adol Med. 1998; 132: 191–93.
21. Bellizzi MC, Dietz WH. Workshop on childhood obesity: summary of the discussion. A J Clin Nutr. 1999; 70: 173–15S.
22. Utter J, Scragg R, Mhurchu CN, Schaff D. At-home breakfast consumption among New Zeeland children: association with body mass index and related nutrition behaviors. J American Dietetic Association 2007, 107:4:570–76.
23. Szponar L, Sekuła W, Rychlik E, Ołtarzewski M, Figurska K. [W] Badania indywidualnego spożycia żywności i stanu odżywiania w gospodarstwach domowych. (Studies of individual food consumption and state of nutrition in households) Prace IŻŻ 2003, 101:230–443 (in Polish).
24. Kasperczyk J, Jośko J, Bilska J. Sposób odżywiania się oraz wybrane czynniki zdrowego stylu życia wśród młodzieży licealnej. (Mode of nutrition and selected factors of health-promoting life style among secondary school adolescents). Probl Hig Epidemiol. 2007; 88(2): 157–61 (in Polish).
25. Malara B, Jośko J, Kasperczyk J, Kamecka-Krupa J. Rozpowszechnienie zaburzeń odżywiania wśród młodzieży w wybranych miastach województwa śląskiego. (Prevalence of nutritional disorders in selcted cities in the Silesian Region) Probl Hig Epidemiol. 2010; 91(3): 388–92 (in Polish).
26. Downs DS, DiNallo JM, Savage JS, Davison KK. Determinants of eating attitudes among overweight and non-overweight adolescents. J Adolesc Health. 2007; 4: 138–45.
27. Nicklas TA, O'Neil CE, Berenson GS. Nutrient contribution of breakfast, secular trends, and the role of ready-to-eat cereals: a review of data from Bogalusa Hearth Study. Am J Clin Nutr. 1998; 67 Suppl: 757–763S.
28. Dubois L, Girard M, Potvin Kent M, Farmer A, Tatone-Takuda F. Breakfast skipping is associated with differences in meal patterns, macronutrient intakes and overweight among pre-school children. Pub Health Nutr. 2008; 12: 19–28.
29. Basiotis PP, Lino M, Anand RS. Eating breakfast greatly improves school children's diet quality. Fam Econ Nutr Review. 1999; 12: 81–84.
30. Cohen B, Evers S, Manske S, Bercovitz K, Edward HG. Smoking, physical activity and breakfast consumption among secondary school students in southwestern Ontario community. Can J Pub Health. 2003; 54: 281–7.
31. Rampersaud GC, Pereira MA, Girard BL, Adams J, Metzl JD. Breakfast habits, nutritional status, body weight, and academic performance in children and adolescents. J Am Diet Assoc 2005; 105: 743–60.
32. Gleason PM, Dodd AH. School Breakfast Program but not School Lunch Program participation is associated with lower body mass index. J Am Diet Assoc 2009; 109: 2, S118–28.
33. Pałgan K, Bartuzi Z. Genetic aspects of food allergy. Post Dermatol Alergol 2011; XXVIII, 2: 103–106.
34. Jarosz M. Zasady prawidłowego żywienia dzieci i młodzieży oraz wskazówki dotyczące zdrowego stylu życia. Narodowy Program Zapobiegania Nadwadze i Otyłości oraz Przewlekłym Chorobą Niezakaźnym poprzez Poprawę Żywienia i Aktywności Fizycznej POL-HEALTH (2007–2011). (Principles of healthy nutrition of children and adolescents and guidelines concerning health-promoting life style. Programme of Prevention of Overweight, Obesity and Non-infectious Diseases by Improv4ment of Physcial Activity POL_HEALTH 2007–2011) IŻŻ, Warszawa 2008: 45–374 (in Polish).
35. Szczygieł A. Podstawy fizjologii żywienia. Żywienie człowieka. (Essentials of physiology of nutrition. Human nutrition) PZWL, Warszawa 1975 (in Polish).
36. Gawęcki J, Hryniewiecki L. Podstawy nauki o żywieniu. (Essentials of nutrition sciences) PWN, Warszawa 2000: 333–45 (in Polish).
37. Nadolna I, Przygoda B, Troszczyńska A, Kunachowicz H. Tabele wartości odżywczej produktów spożywczych. (Tables of nutritional value of food products) Prace IŻŻ, Warszawa 2000 (in Polish).
38. Krogulska A, Białek J, Wąsowska-Królikowska K. Tolerance to heated cow's milk and egg in children with allergy to this food. Post Dermatol Alergol 2011; XXVIII, 4: 277–284.
39. http://www.gis.gov.pl (access: 23.11.2012)
40. Raport z badań: Zdrowie subiektywne, zadowolenie z życia i zachowania zdrowotne uczniów szkół ponadgimnazjalnych w Polsce (Self-reported health, life satisfaction and health behaviours of secondary and post-secondary school adoilescents in Poland) (ed.): Oblacińska A, Woynarowska B, Kołoło H. Zachowania zdrowotne-sposób żywienia. Warszawa 2006: 51–56 (in Polish).
41. Pieszko-Klejnowska M, Pęgiel-Kamrat J, Zarzeczna-Baran M i in. Różnice w sposobie odżywiania się młodzieży gimnazjalnej w województwie pomorskim w zależności od płci. (Differences in the mode of nutrition among junior high school adoilescents in the Pomeranian region by gender). Probl Hig Epidemiol. 2006; 87(4): 278–283 (in Polish).
42. Savage JS, Fisher JO, Birch LL. Parental influence on eating behavior: conception to adolescence. J Law Med Ethics. 2007; 35: 22–34.
43. Hesketh K, Waters E, Green J, Salmon L, Williams J. Healthy eating, activity and obesity prevention: a qualitative study of parent and child perceptions in Australia. Health Promotion Int. 2005: 20: 19–26.
44. Gacek M. Niektóre racjonalne i wadliwe wybory żywieniowe młodzieży licealnej w Krakowie. (Selected rational and wrong nutritional choices among secondary school adiolescents in Cracow). Wychowanie fizyczne i zdrowotne 2004; 5: 13–15 (in Polish).
45. Szanecka E, Małecka-Tendera E. Zmiana nawyków żywieniowych a problem otyłości u dzieci. (Change in nutritional habits and problem of obesity among children) Endokrynol Otyłość Zab Przemian Materii 2006; 2(3): 102–107 (in Polish).
46. Zimmermann MB, Gübeli C, Püntener C, Molinari L. Overweight and obesity in 6–12 year old children in Switzerland. Swiss Medical Weekly 2004; 134: 523–8.
47. Stamatakis E, Primatesta P, Chinn S, et al. Overweight and obesity trends from 1974 to 2003 in English children: what is the role of socioeconomic factors? Arch Dis Child. 2005; 90: 999–1004.
48. Carroquino MJ. Prevalence of overweight and obesity in children and adolescents, ENHIS, 2009.
49. Wądołowska L. Żywieniowe podłoże zagrożeń zdrowia w Polsce. (Nutritional background of health risks in Poland) Wydawnicwo UWM, Olsztyn 2010. S 74 (in Polish).
50. Bernekow R, Rasmussen V, Rivett D. The European Network of Health Promoting Schools – an alliance of health, education and democracy. Health Education 2000; 2: 61.
51. Zawadzka B. Szkoła promująca zdrowie ucznia i nauczyciela. (School promoting health of a schoolchild and teacher) Wych Fiz Zdr. 1995; 3: 102–106 (in Polish).