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Dietary Habits and Nutritional Status of Female Adolescents from the Great Poland Region

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The aim of this study was to assess the nutritional status and dietary habits among female adolescents. Four hundred seventy nine subjects aged from 17 to 18 years, from secondary schools of the Great Poland Region participated in the study. Anthropometric parameter measurements included those of body height and mass, skinfold thickness and circumferences of waist, hip and arm. The measurements served to calculate the percentage of fat mass and arm muscle area. Nutritional questionnaires were used to estimate the frequency and intake of selected food products. Mean values of body height and mass were approximately in the 50th percentile. However, 13.7% of females were underweight, 7.7% were overweight and 1.2% were obese. Cluster analysis resulted in 3 clusters, of which the second one showed the most detrimental nutritional habits. This cluster was characterised by the lowest intake of dairy products, fruits and vegetables, fish, meat and also by frequent long breaks between meals (longer than 5 hours). Improper nutritional behavior is a frequent finding in female adolescents, in Poland. Nevertheless, overweight and obesity are not more common than in other countries. Studies in this area should be continued and extended.

INTRODUCTION

Adolescence is not only a critical evolutionary stage for humans, but also the time of our rapid development that as a result determines energy and nutrient requirements [Oliveira e*t al.*, 2000; Tur *et al*., 2004]. Factors such as one's lifestyle and dietary habits influence health status and may also contribute to the quality of health during forthcoming adulthood [Tur *et al*., 2004]. Available data show a growing trend of eating disorders and obesity all over the world, specifically among children and adolescents [Sikorska–Wisniewska, 2007]. Obesity is one of the most important factors that increases the risk of high blood pressure, type 2 diabetes mellitus, hypercholesterolemia, cardiovascular diseases (CVD's) and certain types of neoplasms [Bronner, 1996; Tur *et al*., 2004]. On the other hand, having a poor body image may result not only in anorexia nervosa or bulimia, but also in many other health problems such as osteoporosis, CVD, gastrointestinal complications and depression [Klein *et al.,* 2006].

Economic and social changes in Western Europe are reflected in nutritional habits [Grigg, 1995]. Epidemiologic evidence shows a growing consumption of foods high in sugar and fat, and also trends in decreasing physical activity among young people [Bronner, 1996]. The altered lifestyles result in changes of dietary-related measures such as BMI and skinfold thickness values [Forrest & Leeds., 2007]. The dietary norms estimated by the Organization for Economic Co-operation and Development (OECD) were updated recently and point to a need to decrease sugar, animal fat and meat consumption and to increase the intake of cereals, fruits and vegetables [Srinivasan *et al.,* 2006].

Taking into consideration the assumptions mentioned above, the aim of this study has been to assess the correlation between nutritional status and dietary habits among female adolescents from the Great Poland Region.

MATERIAL AND METHODS

The study was conducted in May 2008 and included 479 female adolescents,17–18 years old, from secondary schools. Inclusion criteria included age, female gender and their education level (first and second grades of secondary school). The frequency and quality of food intake was assessed with a self-administrated dietary questionnaire which was filled out by all subjects. The questionnaires estimated meal consumptions and indicated the selected food products.

Body height and mass were measured using a SECA digital scale, with approximations of 0.5 cm and 0.1 kg, respectively. Circumferences of waist, hip and arm were as-

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sessed with a flexible tape measure with an approximation of 0.1 mm. Body Mass Index (BMI) was calculated to identify the obesity, overweight and malnutrition among studied subjects [Cole, 1990; Cole *et al.,* 2000]. Four skinfolds were also measured (biceps, triceps, subscapular and suprailiac regions) with the use of skinfold calipers (0.2 mm precision; Harpenden company) in order to estimate the amount of fatty tissue present. The percentage of fat mass (%FM) was calculated using the Durnin & Womersley equation [Durnin &Womersley, 1974] and the arm muscle area (AMA) was estimated according to Frisancho's formula [Frisancho, 1981]. For the prediction of the percentage of body fat (%FM), based on the BMI a linear regression model was used.

Considering the size of the data set, an appropriate cluster analysis was preceded with factorial analysis which was used as the method for a reduction of variables. The Kolmogorov-Smirnov test was applied to test for a normal distribution [Stanisz, 2006]. The selection of factors in cluster analysis was based on Kaiser's criteria and Cattell's tests [Cattell, 1966; Kaiser, 1960]. The applied methods grouped variables using k-means method. The procedure involves movement of objects from the cluster to the cluster in order to minimize the variances within clusters and maximize variances between clusters [Marek & Noworol, 1987]. For further cluster analysis only essential factors that correlated with variables crossing the value of 0.7 were selected. The accuracy of cluster selection was estimated by comparison of variability inside the clusters with the variability between them. Statistica 8.0. PL. software was used for both statistical analyses (factorial and cluster). The level of significance was set at $p<0.05$.

RESULTS

The anthropometric characteristic of the studied group is presented in Table 1. Mean values of body height and mass and BMI achieved approximately the 50th percentiles. However, almost 13.7% of the subjects studied were underweight, 7.7% were overweight and 1.2% were obese. According to Frisancho's formula [Frisancho, 1981] the mean value of triceps skinfolds was significantly lower (38.4%) than the 50th percentile (reference value 19 mm). The average percentage of body fat in the female adolescents exceeded maximum preferred fatness levels for their age [Brown & Jones, 1977]. Percentile values for arm muscle area (AMA) were within the normal range [Frisancho, 1990]. A correlation coefficient between AMA and % FM was average ($r=0.33$; $p<0.0001$). A correlation coefficient between BMI and % FM was very high ($r=0.74$) and the unitary increase of BMI resulted in an increase of about 0.92±0.04% FM in the analysed group (% FM$=0.9216 \cdot$ BMI + 5.5678; $p<0.0001$).

The conducted study also assessed nutritional habits of the group of adolescents (Figure 1). More than 55% of the girls ate breakfast regularly, about 18.5% had it often, and nearly 26.4% reported not having breakfast. Most of the questioned girls (88%) had 3 to 5 meals per day. However, nearly half of them (46%) declared that they snacked additionally between main meals. Nearly 7% of the adolescents ate only 2 meals per day.

Fish were usually consumed once per month (49.1%). However, 42.2% of the studied girls declared the consumption of fish once per week. Only 8.7% of adolescents reported frequent fish intake (2 to 3 times per week). Milk and other dairy products were usually consumed everyday: once per day in 38% or a few times per day in 21.2% of the subjects studied. Furthermore,

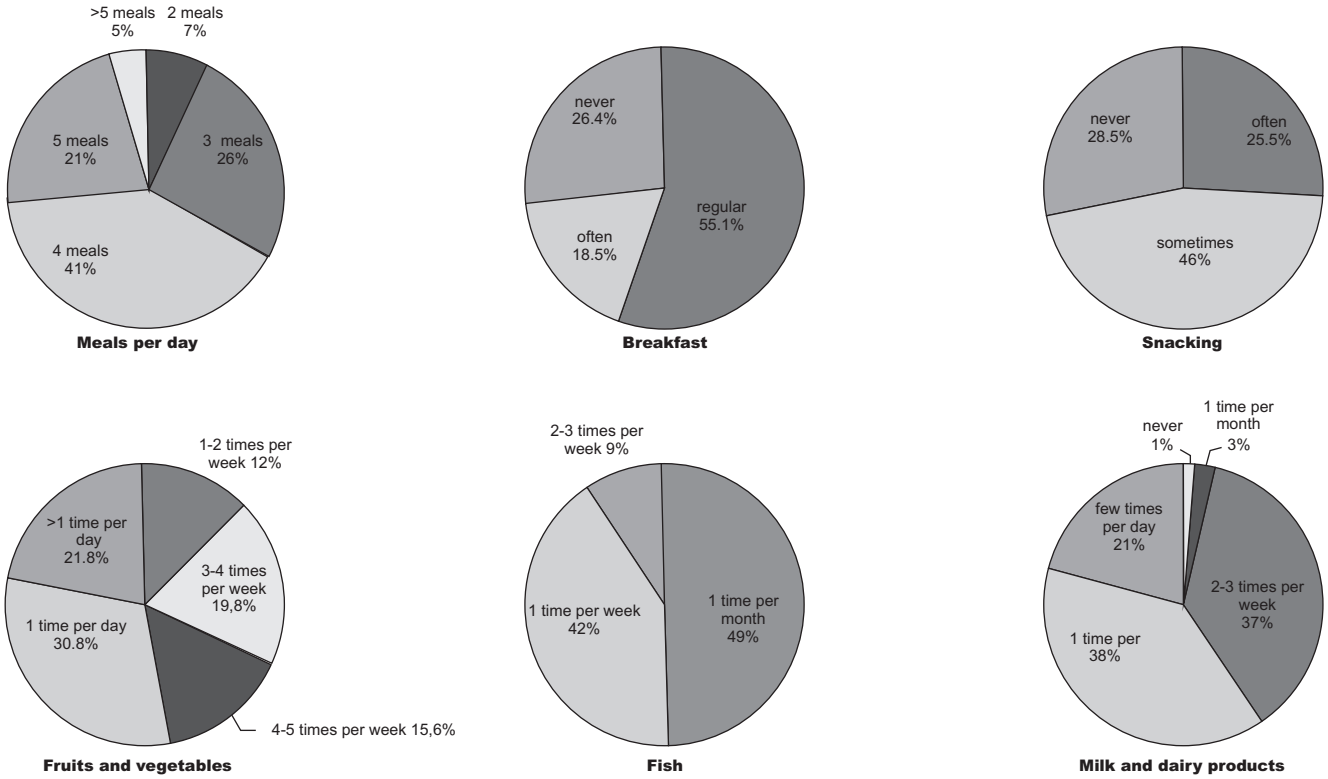

FIGURE 1. Intake frequency of selected food products.

TABLE 1. Anthropometric characteristics of the studied group (479 female adolescents).

Females (n=479)	$\bar{x}$ ± SD	Range
Body mass (kg)	59.3±10.0	52.4–64.3
Height (cm)	167.2±6.3	163.0–172.0
BMI (kg/m^2)	21.2±2.9	19.4–22.7
Waist circumference (cm)	78.2±8.8	72.0–83.0
Hip circumference (cm)	98.2±8.2	94.0–102.0
WHR	0.80±0.15	0.75–0.83
Arm circumference (cm)	26.5±2.7	25.0–28.0
Arm Muscle Area (cm^2)	42.0±7.8	36.5–47.0
Biceps (mm)	9.9±3.6	7.4–12.0
Triceps (mm)	11.7±3.4	9.0–13.8
Suprailiac (mm)	14.7±4.5	11.2–17.8
Subscapular (mm)	11.8±3.9	9.2–13.6
Fat Mass (%)	25.1±3.7	22.7–36.6

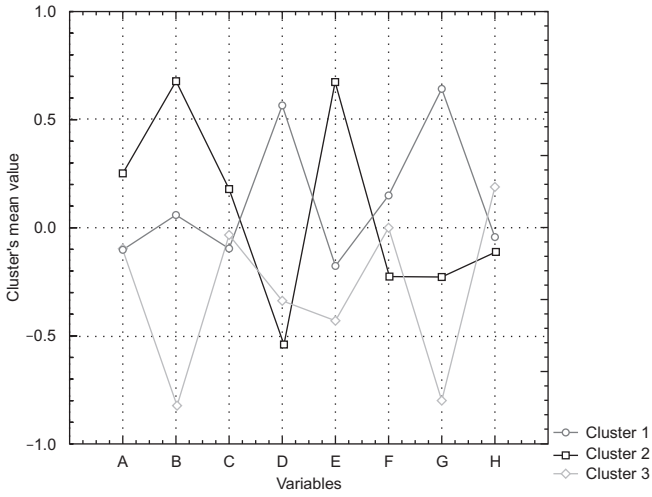

FIGURE 2. Mean standardized values of the analysed parameters in 479 female adolescents (A – body mass, BMI, % FM; B – Regular consumption of a supper; C – Snacks between meals; D – Consumption of dairy products, fruits and vegetables, E – Breaks between meals; F – Meat consumption; G – Consumption of fish, H – Waist to Hip Ratio).

nearly 37.2% of the studied adolescents consumed dairy products two/three times per week, whereas 2.7% did so once per month, only 0.8% had no milk nor dairy products in their diet.

The analysis of the frequency of intake of fruits and vegetables revealed that 12.1% of adolescents ate them one/two times per week, 19.8% – about three/four times per week, and 15.6% – about 4–5 times per week. Among girls who consumed fruits and vegetables every day, about 30.8% ate them once per day and 22% did so more than once per day.

Cluster analysis revealed 3 clusters which are presented in Table 2 and Figure 2. The first cluster was characterised by a slightly higher intake of milk and dairy products, vegetables, fruits and fish. The characteristic features of the second cluster were the lower than average intake of milk and its products, vegetables and fruits, more regular consumption of meals, especially regular supper intake. The third cluster was characterised by lower than average consumption of fish and less regular intake of supper. Such parameters as BMI, WHR and percentage content of body fat were not specific for all the analysed clusters.

DISCUSSION

The results of this study confirm earlier reports which documented an increase in the frequency of poor dietary habits in adolescents in Poland. The reported dietary habits and selected parameters of nutritional status studied correspond to body size. This research may be a valuable analysis adding to the overview of Polish health status of adolescents, since the population surveyed was numerous and controlled in terms of sex and age.

In the present study most subjects were characterised by an average BMI value that ranged from the the 25th to the 75th percentile, and the mean value of BMI at the 50th percentile (21.24±2.88 kg/m^2) was similar to findings of other authors [Turconi *et al.,* 2006; Nielsen & Andersen, 2003]. The problem of obesity (BMI > 95th percentile) afflicted over 1 percent of the studied female adolescents . Ostrowska-Nawarycz & Nawarycz [2007] reported higher frequency of obesity in a similar group of adolescents (3.7%), however constitut-

TABLE 2. Cluster analysis of the studied group of female adolescents.

Analysed group (n=479)		Cluster 1 (n=211)	Cluster 2 (n=139)	Cluster 3 (n=129)	Differences between clusters p value*		
					1 *vs*. 2	2 *vs*. 3	1 *vs*. 3
Body mass (kg)	$\bar{x}$	58.47	61.23	58.50	0.0149	0.0549	0.7749
	SD	10.06	10.75	8.80			
	Range	51.00–63.70	53.60–66.00	52.60–63.00			
BMI (kg/m^2)	$\bar{x}$	21.03	21.88	20.94	0.0140	0.0436	0.7994
	SD	2.83	3.25	2.47			
	Range	19.27–22.33	19.74–23.27	19.45–22.44			
WHR	$\bar{x}$	0.78	0.80	0.84	0.0382	0.1836	0.0006
	SD	0.05	0.06	0.27			
	Range	0.74–0.81	0.75–0.84	0.75–0.85			
Fat Mass (%)	$\bar{x}$	24.73	25.90	24.87	0.0041	0.0318	0.5482
	SD	3.76	3.74	3.52			
	Range	22.07–27.23	23.43–28.34	22.70–27.43			

ing a different age group (7–18 years) and originating from a different region of the country. A higher percentage of overweight or obese adolescents was reported in different parts of the world [Janssen *et al*., 2005]. The prevalence of overweight in the present study was lower than that estimated in the US (30%) population [Ogden *et al*., 2002]. Forrest & Leeds [2007] showed that being overweight and obese was also an important health problem in Mexican-American adolescents, nearly 40% of studied subjects had BMI values higher than 25 kg/m^2. On the other hand, the percentage of body fat in the studied female adolescents was higher than the body fat content found in a group of Italian girls [Turconi *et al.,* 2006], German female adolescents [Schaefer *et al.,* 1998] and in the US Caucasian young girls [Ellis, 2000].

Chomtho *et al.* [2006] has also shown that arm anthropometry, including AMA, is useful for predicting FM. However, in the present study the correlation coefficient between % FM and AMA was low ($r=0.33$; $p<0.0001$). Interestingly, the value of AMA in Polish girls was higher than that found in Brazilian girls with similar value of BMI [Oliveira *et al*., 2000]. McCarthy *et al.* [2001] and Wei *et al.* [1997] showed that waist circumference (WC) was a better predictor of obesity in adolescents rather than WHR. WC has been shown to correlate well with intra-abdominal fat mass, which is related to an atherogenic lipoprotein profile [McCarthy *et al.,* 2001]. The mean value of WC (78.2 ± 8.84) of the analysed Polish girls was higher than that reported in US [Ogden *et al.,* 2002], British [McCarthy *et al.,* 2001], and Italian [Turconi *et al.,* 2006] female adolescents.

Eating behaviors of young people have come into the spotlight in recent years, amid claims that many adolescents in Western countries have a poor diet [Cavadini *et al.,* 2000; Hurson & Corish, 1997; Prescott-Clarke & Primatesta 1998; Rampersaud *et al*., 2005]. Not only well-balanced daily food ratios should be considered, but also regular meal intervals and supplying adequate amounts of nutrients should be emphasized. Breakfast as a part of a healthy diet and lifestyle can have a positive impact on adolescents health and well-being. In the current study, 7% of the studied adolescents consumed only 2 meals per day; however, one fourth had no first meal at all. Similar data have been obtained in other studies, according to which breakfast skipping is highly prevalent in the United States and Europe (10% to 30%) [Rampersaud *et al.,* 2005]. It is very important since it has been proven that eating the first meal of the day may improve cognitive functions related to memory, school grades, and school attendance [Rampersaud *et al.,* 2005].

Long breaks between meals usually favor eating between meals. Snacking is a well-established eating pattern amongst adolescents [Jahns *et al*., 2001]. Moreover, adolescents consume snack foods (especially sweets) more frequently than adults do [Anderson *et al.,* 1993]. About 67% of adolescents ate snacks a few times a week. The intake of sweets in the present study was very high and these products were eaten a few times per day by more than one fourth of the surveyed girls. The fact that adolescents snack frequently, especially in their leisure time, was also proven in an Australian population in a group of more than three thousand subjects. Those adolescents who snacked often were more likely to skip meals [Savige *et al.,* 2007]. Similar results have been obtained in the current study, which may be suggest that eating snacks between meals may be the main reason for skipping at a minimum one meal per day. A study of Swedish adolescents revealed that the in-between meal snacking accounts for the majority of energy intake [Sjöberg *et al.* 2003]. Samuelson [2000] reported that snacking and light meals are very common in young people, contributing 25–35% of their daily energy intake [Samuelson, 2000]. Thus, the reduction of breaks between meals may be of primary importance in changing the dietary habits of this studied group.

Milk and other dairy products provide the most important sources of calcium during adolescence, so a decline in milk consumption may have a serious and detrimental effect on bone health in this age group. Kranz *et al*. [2007] showed that the consumption of dairy products among adolescents was significantly lower than that which is recommended. In the present study over 50% of female adolescents were consuming dairy products every day. Children and adolescents consume more of the highest-fat varieties of cheese, yogurt, ice-cream and diary-based toppings. As suggested by Johnson *et al*. [2002], perhaps flavored milks offer a well-accepted nutritional alternative to the wide array of beverages available to children and adolescents.

The World Health Organization recommends a minimum of 1–2 fish consumptions per week with an intake of 200–500 mg of fatty acids (docosahexaenoic acid & eicosapentaenoic acid) with a single fish portion [Kris-Etherton *et al.,* 2009]. Fish consumption in the current study was insufficient to provide a proper amount of *n*-3 polyunsaturated fatty acids. Interestingly consumption of fish in Iceland is also lower than expected and is comparable with the intake of Polish adolescents. Harel *et al*. [2001] documented that about one-third of adolescents consumed fish at least once per week, and 29% consumed fish once a month. The main reasons why subjects consumed fish rarely (≤3 times/year) or never were linked to their dislike or allergy.

The low fruit intake observed in the studied group is also alarming, especially in the second cluster. Vegetables should be eaten at least 5–6 times per day and fruits about 4–5 times per day [WHO, 1993]. Unfortunately, adolescent girls did not fulfill these recommendations and only 5.6% ate them more than three times per day. However, such an observation is not only limited to Polish population. Low fruit and vegetable intakes were also characteristic for English and Irish teenagers [Hurson & Corish, 1997; Prescott-Clarke & Primatesta, 1998]. Particular areas of concern include an increased intake of dietary fats in comparison to fruits and vegetables [WHO, 1993].

CONCLUSIONS

Improper nutritional behavior is a frequent finding in female adolescents, in Poland. Nevertheless, overweight and obesity is not more common than that in other countries. Studies in this area should be continued and broadened.

REFERENCES

1. Anderson A.S., MacIntyre S., West P., Adolescent meal patterns: grazing habits in the west of Scotland. Health Bull., 1993, 51, 158–165.

2. Bronner Y.L., Nutritional status outcomes for children: Ethnic, cultural and environmental context. J. Am. Diet. Assoc., 1996, 90, 891–903.
3. Brown W.J., Jones P.R.M., The distribution of body fat in relation to habitual activity. Ann. Hum. Biol., 1977, 4, 537–550.
4. Cattell R.B., The score test for the number of factors. Multiv. Behav. Res. Biometr., 1966, 1, 245–276
5. Cavadini C., Siega-Riz A.M., Popkin B.M., US adolescent food intake trends from 1965–1996. Arch. Dis. Child., 2000, 83, 18–24.
6. Chomtho S., Fewtrell M.S., Jaffe A., Evaluation of arm anthropometry for assessing pediatric body composition: Evidence from healthy and sick children. Pediatr. Res., 2006, 59, 860–865.
7. Cole T.J., Bellizzi M.C., Flegal K.M., Dietz W.H., Establishing a standard definition for child overweight and obesity worldwide: international survey. Brit. Med. J., 2000, 320, 1240–11246.
8. Cole T.J., The LMS method for constructing normalized growth standards. Eur. J. Clin. Nutr., 1990, 44, 45–60.
9. Durnin J.V.G.A., Womersley J., Body fat assessed from total body density and its estimation from skinfold thickness: measurements on 481 men and women aged from 15 to 72 years. Brit. J. Nutr., 1974, 32,77–97.
10. Ellis K.J., Human body composition: In Vivo Methods. Physiol. Rev., 2000, 80, 649–680.
11. Forrest K.Y.Z., Leeds M.J., Prevalence and Associated Factors of Overweight among Mexican-American Adolescents. J Am. Diet. Assoc., 2007, 10, 1797–1800.
12. Frisancho A.R., Anthropometric standards for the assessment of growth and nutritional status. 1990, *in*: Ann Arbor: University of Michigan Press.
13. Frisancho A.R., New norms of upper limb fat and muscle area for assessment of nutritional status. Am. J. Clin. Nutr., 1981, 34, 2540–2545.
14. Grigg D., The nutritional transition in Western Europe. J. Hist. Geogr., 1995, 22, 247–261.
15. Harel Z., Riggs S., Vaz R., White L., Menzies G., Omega-3 polyunsaturated fatty acids in adolescents: knowledge and consumption. J. Adolesc. Health., 2001, 28, 10–15
16. Hurson M., Corish C., Evaluation of lifestyle, food consumption and nutrient intake patterns among Irish teenagers. Ir. J. Med. Sci., 1997, 166, 225–230.
17. Jahns L., Siega Riz A.M., Popkin B.M., The increasing pattern of snacking among US children from 1997–96. J. Pediatr. 2001, 138, 493–498.
18. Janssen I., Katzmarzyk P.T., Boyce W.F., Vereecken C., Mulvihill C., Roberts C., Comparison of overweight and obesity prevalence in school-aged youth from 34 countries and their relationships with physical activity and dietary patterns. Obes. Rev., 2005, 6, 123–32.
19. Johnson R.K., Frary C., Wang M.Q., The nutritional consequences of flavored-milk consumption by school-aged children and adolescents in the United States. J. Am. Diet. Assoc., 2002, 102, 853–856
20. Kaiser H.F., The application of electronic computers to factor analysis. Educ. Psychol. Measure., 1960, 20, 141–151.
21. Klein J.D., Postle C.K., Kreipe R.E., Smith S.M., McIntosh S., Spada J., Ossipin-Klein D., Do physicians discuss needed diet and nutrition health topics with adolescents?. J. Adolesc. Heal., 2006, 38, 608e1–608e6.
22. Kranz S., Lin P-J., Wagstaff D.A., Children's dairy intake in the United States: Too little, too fat?.J. Pediatr., 2007, 151, 642–643.
23. Kris-Etherton P.M., Grieger J.A., Etherton T.D., Dietary references intakes for DHA and EPA. P.L.E.F.A, 2009, 81, 99–104.
24. Marek T., Noworol Cz., *Zarys analizy skupień- niehierarchiczne i hierarchiczne techniki skupiania. 1987,* in: Wielozmiennowe modele statystyczne w badaniach psychologicznych (ed. J. Brzeziński). PWN, Poznan, pp. 184–204 (in Polish).
25. McCarthy H.D., Jarrett K.V., Crawley H.F., The development of waist circumference percentiles in British children aged 5.0 ± 16.9 y. Eur. J. Clin. Nutr., 2001, 55, 902–907.
26. Nielsen G.A., Andersen L.B., The association between high blood pressure, physical fitness, and body mass index in adolescents. Prev. Med., 2003, 36, 229–234.
27. Ogden C.L., Flegal K.M., Carroll M.D., Johnson C.L., Prevalence and trends in overweight among US children and adolescents 1999–2000. JAMA, 2002, 288, 1728–1732.
28. Oliveira M.N.G., Cezar A.E.H.S., de Abreu E., Comparison of the anthropometric assessment of adolescents of privileged and unprivileged social and economic levels. Nutr. Res., 2000, 20, 1423–1436.
29. Ostrowska-Nawarycz L., Nawarycz T., Prevalence of excessive body weight and high blood pressure in children and adolescents in the city of Lódz. Kardiologia polska, 2007, 65, 1079–1087.
30. Prescott-Clarke P., Primatesta P., Health Survey for England: The Health of Young People 1995–1997. London: The Stationery Office, 1998.
31. Rampersaud G.C., Pereira M.A., Girard B.L., Adams J., Metzl J.D., Breakfast habits, nutritional status, body weight, and academic performance in children and adolescents. J. Am. Diet. Assoc. 2005, 105, 743–60.
32. Samuelson G., Dietary habits and nutritional status in adolescents over Europe. An overview of current studies in the Nordic countries. Eur. J. Clin. Nutr., 2000, 54, 21–8.
33. Savige G., MacFarlane A., Ball K., Worsley A., Crawford D., Snacking behaviors of adolescents and their association with skipping meals. Int. J. Behav. Nutr. Phys. Act., 2007, 4, 36.
34. Schaefer F., Georgi M., Wuehl E., Schaerer K., Body mass index and percentage fat mass in healthy German schoolchildren and adolescents. Internal. J. Obes., 1998, 22, 4614–69.
35. Sikorska – Wisniewska G., Overweight and obesity among children and adolescents. Żywność. Nauka. Technologia. Jakość., 2007, 55, 71– 80 (in Polish).
36. Sjöberg A., Hallberg L., Höglund D., Hulthén L., Meal pattern, food choice, nutrient intake and lifestyle factors in The Göteborg Adolescence Study. Eur. J. Clin. Nutr., 2003, 57, 1569–78.
37. Srinivasan C.S., Irz X., Shankar B., An assessment of the potential consumption impacts of WHO dietary norms in OECD countries. Food Policy, 2006, 31, 53–77.
38. Stanisz A., Przystępny kurs statystyki z zastosowaniem STATISTICA PL. na przykładach z medycyny. 2006, T1,StatSoft, Krakow (in Polish)
39. Tur J.A., Puig M.S., Benito E., Pons A., Associations between sociodemographic and lifestyle factors and dietary quality among adolescents in Palma de Mallorca. Nutr., 2004, 20, 502–508.
40. Turconi G., Guarcello M., Maccarini L., Bazzano R., Zaccardo A., Roggi C., BMI values and other anthropometric and func-

tional measurements as predictors of obesity in a selected group of adolescents. Eur. J. Nutr., 2006, 45, 136–143.
41. Wei M., Gaskill S. P., Haffner S. M., Stern M. P., Waist circumference as the best predictor of noninsulin dependent diabetes mellitus (NIDDM) compared to body mass index, waist / hip ratio and other anthropometric measurements in Mexican Americans – a 7 – year prospective study. Obes. Res., 1997, 5, 16–23
42. WHO, World Health Organization, The health of young people: a challenge and a promise. Geneva, WHO, 1993.
43. Xie B., Liu C., Chih-Ping C. Jiang X., Weight perception and psychological factors in Chinese adolescents. J. Adolesc. Heal., 2003, 33, 202–210.

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