NUTRITIONAL STATUS, DIETARY HABITS AND BODY IMAGE PERCEPTION IN MALE ADOLESCENTS

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Background. Anthropometric parameters provide a lot of information about body composition and nutritional status, regardless whether they relate to obesity or malnutrition. The aim of this study was to assess the relationship between nutritional status, dietary habits and body image perception among male Polish adolescents.

Material and methods. The study population primarily comprised 322 male adolescents aged 17-18 years from Western Poland, with thirty respondents however, dropping out of the study during its course. Anthropometric appraisal included body height and weight, four skinfolds thickness, circumferences of the waist, hip and arm. The percentage of fat mass and arm muscle area was calculated. The self-administrated questionnaires were used to estimate the frequency and quality of food intake, as well as the perception of body image of the studied subjects. In order to identify the similarity of nutritional habits and anthropometric parameters of adolescent males, cluster analysis was applied.

Results. The mean values of body weight and height were close to 50th percentile. However, 10.7% of males were underweight, 10.7% overweight and 1.3% obese. The tendency to underestimate own level of fatness among overweight and obese subjects was observed. Over 90% of the studied subjects consider "average" silhouette as an ideal.

Conclusions. Polish obese and overweight adolescents show a tendency to underestimate their level of fatness and perceive themselves as "average", despite possessing an excessive amount of body fat.

Key words: adolescents, nutritional habits, anthropometric measurements, body image perception

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INTRODUCTION

Anthropometric parameters provide a lot of information about body composition and nutritional status, regardless of the fact whether they relate to obesity or malnutrition [Freedman and Perry 2000]. According to the data from National Health and Nutrition Examination Surveys (NHANES) (1976-1980 and 2003-2006) for children aged 12-19, prevalence of obesity among U.S. adolescents has increased from 5% to 17.6% [CDC]. Since the beginning of the 80s of the 20th century the incidence of obesity in European Union has increased 3 times and 15 million of children are expected to be obese in 2010 [WHO NCD InfoBase 2005]. The research performed in Poland in 1995-2005 showed that 8.8% of children aged 13-15 were overweighed and 4.5% obese [Oblacińska and Jodkowska 2007]. On the other hand, the results from the 2003-2006 NHANES indicate that 3.3% children and adolescents in US aged 12-19 are underweighted [CDC].

Many physical, mental and emotional changes are characteristic for adolescent age [Carraro et al. 2010]. Lifestyle and dietary factors determine health status [Freedman and Perry 2000]. Data from many countries show positive changes in nutritional habits of adolescents. However, high consumption of animal fat, meat and food rich in sugar is also observed [Grigg 1995, Srinivasan et al. 2006]. Low physical activity among adolescents is related to unbeneficial changes in dietary-related factors such as BMI, waist to hip ratio (WHR) or waist circumference (WC) that may be useful in identifying adolescents at risk of suffering from cardiovascular diseases (CVD) at a later stage [Bronner 1996, Ramirez-Lopez et al. 2001]. It seems to be vital to remember that *prevention needs to acknowledge the context as much, if not more so, than individuals* [Cowen 1973]. Neumark-Sztainer [2009] provided five recommendations for health care that can prevent obesity and eating disorders in adolescents, which were selected on the basis of findings from Project Eating Among Teens.

Taking into consideration the assumptions mentioned above, the aim of this study was to assess the relationship between nutritional status, dietary habits and the perception of body image among male adolescents from Western Poland.

MATERIAL AND METHODS

This study was carried out in May 2008. Three-hundred-twenty-one male adolescents from Western Poland aged 17-18 participated in the study. However, the full data were obtained from 292 individuals. Thirty volunteers did not completely fill in the self-administrated questionnaires, which were used to estimate the frequency and the quality of meals as well as the self perception of body silhouette. The questionnaires consisted of individually fulfilled multiple choice and open questions. Body Silhouette Charts were used to describe real and the most ideal silhouettes. The scale was applied to assess the type of silhouettes and consisted of four charts: 1 – slim silhouette, 2 – average silhouette, 3 – plump silhouette, 4 – fat silhouette.

The achieved ranks enabled the assessment of silhouette perception convergence with BMI. The anthropometrical parameters included the measurement of body weight and height (SECA digital scale with an approximation of 0.5 cm and 0.1 kg respectively) as well as waist, hip and arm circumferences (assessed with the means of a flexible tape with an approximation of 0.1 mm). Four skinfolds (biceps, triceps, subscapular

and suprailiac skinfold) were evaluated by a caliper with a 0.2 mm precision (Harpenden company, UK) to estimate the amount of fatty tissue according to Durnin and Womersley equation [1974]. The arm muscle area (AMA) was calculated with the use of the equation of Frisancho [1990]. BMI was calculated to identify the obesity, overweight and malnutrition within the studied group [Cole et al. 2000, Cole 1990]. Cluster analysis was applied for the identification of the groups with similar nutritional habits and anthropometric parameters. Statistica 6.0 Software was used for the statistical analysis. The level of significance was set at $p < 0.05$.

RESULTS

The anthropometric characteristics of the studied subjects is presented in Table 1. Mean values of body height and weight and BMI reached approximately 50th percentile. 10.7% of the studied subjects were underweight, 10.7% overweight and 1.3% obese. The significant correlation between BMI and % FM was stated ($r = 0.69$; $p < 0.05$). The unitary increase of BMI was related to the increase of % FM of about 0.97 ±0.06% (% FM = $0.9732 \times$ BMI $- 7.8925$; $p < 0.0001$). Correlations between other anthropometrical parameters were rather weak. According to Frisancho the mean value of the triceps skinfold reached approximately 50th percentile value (8 mm) [Frisancho 1990]. The average percentage of body fat reached preferred level for age [Brown and Jones 1977]. Similarly, AMA values were within normal range [Frisancho 1990]. The correlation between BMI and body image perception was statistically significant ($r = 0.59$). No other correlations between factors related to nutritional habits, self--estimation of nutritional knowledge and nutritional status were found.

Table 1. Characteristic of the studied group (292 males)

	Mean ±SD	Median	Range
Body weight, kg	70.3 ±11.0	68.5	62.2-76.8
Body height, cm	179.6 ±6.5	179.8	174.5-184.0
BMI, kg/m²	21.8 ±2.8	21.8	20.0-23.2
Waist circumference, cm	81.7 ±8.5	80.5	76.0-86.0
Hip circumference, cm	99.5 ±6.3	99.0	95.0-104.0
WHR	0.82 ±0.06	0.81	0.78-0.85
Arm circumference, cm	28.3 ±3.0	28.0	26.0-30.0
Arm Muscle Area, cm²	54.8 ±11.1	52.9	47.2-60.4
Skinfold's thickness:			
Biceps, mm	6.1 ±2.8	5.2	4.2-7.0
Triceps, mm	7.0 ±3.1	6.2	5.0-8.2
Suprailiac, mm	10.2 ±4.6	8.8	6.6-12.8
Subscapular, mm	9.1 ±3.1	8.2	7.2-10.0
Fat mass, %	13.3 ±4.0	12.7	10.1-15.3

As documented in Table 2, over 50% of boys with BMI < 18.5 kg/m² chose "slim" silhouette as the most similar to the real one. However, 46% of them selected "average" silhouette. Simultaneously, over 80% of malnourished boys appointed "average" silhouette as an ideal. Over 80% of adolescents with proper BMI (18.5-24.9) perceived their own silhouette correctly. 53% overweighed boys (BMI = 25-30 kg/m²) saw themselves slimmer than they were in reality and almost one third of them pointed to a "plump" silhouette as an ideal. Similarly, obese boys (BMI > 30 kg/m²) perceived themselves thinner, "average" silhouette was chosen as an ideal one.

The results of cluster analysis have been presented in Table 3 and on Figure 1. The individuals with normal values of anthropometric parameters (cluster I, II and IV)

Table 2. Self-estimation of body image perception

BMI, kg/m²	n	the most similar to real silhouette $\chi^2 = 121.86$, p < 0.0001				the most ideal silhouette $\chi^2 = 46.28$, p < 0.0001			
		1	2	3	4	1	2	3	4
< 18.5	30	53.3	46.7	0	0	13.3	83.3	3.3	0
18.5-24.9	227	14.1	81.5	3.5	0.9	5.3	93.4	1.3	0
25-30	32	0	56.3	37.5	6.3	0	75	21.9	3.1
≥ 30	3	0	0	100	0	0	100	0	0

1 – slim silhouette, 2 – average silhouette, 3 – plump silhouette, 4 – fat silhouette.

Table 3. Cluster analysis of selected anthropometric factors as a result of nutritional habits among male adolescents

Values	Parameters						
	height cm	weight kg	BMI kg/m²	WC cm	HC cm	WHR	FM %
1	2	3	4	5	6	7	8
Cluster 1 (n = 70)							
x̄	181.2	77.2	23.1	87.5	102.8	0.85	15.8
SD	6.9	13.1	3.5	10.7	7.8	0.08	4.6
Median	180.0	76.8	22.8	86.0	103.0	0.85	14.7
Cluster 2 (n = 75)							
x̄	179.3	70.6	21.8	82.4	99.1	0.83	12.9
SD	6.9	10.6	2.5	8.1	6.2	0.06	3.3
Median	180.0	69.1	21.2	81.0	99.0	0.81	12.8
Cluster 3 (n = 60)							
x̄	179.6	69.2	21.4	79.9	99.0	0.81	12.8
SD	6.7	8.2	2.1	5.7	4.5	0.05	3.3

Table 3 – cont.

1	2	3	4	5	6	7	8
Median	181.0	69.3	21.3	80.0	99.0	0.81	12.7
Cluster 4 (n = 49)							
x̄	177.4	66.2	21.0	78.9	98.5	0.79	12.6
SD	5.6	9.6	2.7	7.0	5.4	0.04	3.5
Median	177.0	64.9	20.9	77.0	97.0	0.79	12.8
Cluster 5 (n = 47)							
x̄	179.0	64.8	20.3	78.0	96.8	0.81	11.8
SD	6.4	8.9	2.0	5.9	4.9	0.04	3.7
Median	180.0	64.3	20.8	77.0	95.0	0.81	11.3

BMI – Body Mass Index, WC – Waist Circumference, WHR – Waist to Hip ratio, %FM – fat mass.
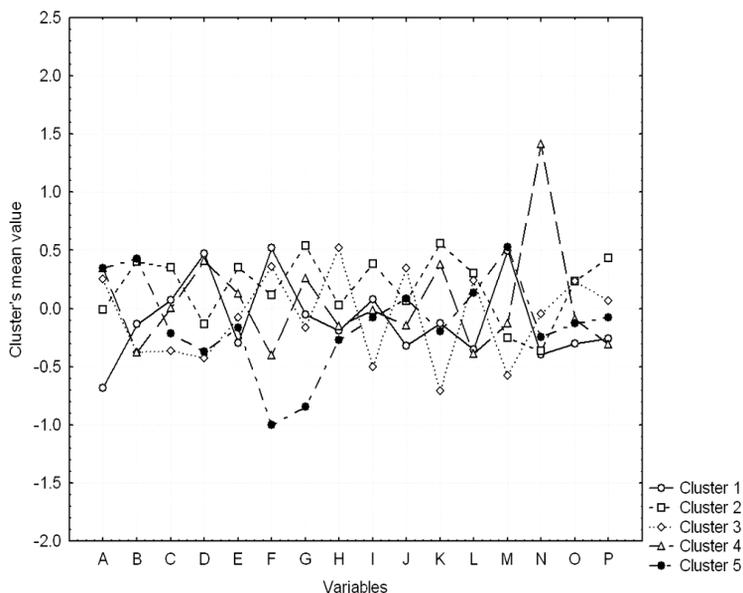
Fig. 1. Mean values of analysed parameters in 5 depicted clusters (292 male adolescents): A – BMI, %FM, self-estimation of the most similar to real silhouette, B – amount of meals consumption, C – snacks be- tween meals – ns, D – supplements of vitamins-minerals, E – slim silhouette as a prosperity factor, F – consumption of fruits, G – con- sumption of vegetables, H – alcohol consumption, I – obese silhou- ette as a determinant of social acceptance, J – regular consumption of meals, K – slim silhouette as an ideal one, L – self-estimation of slim silhouette as a malnutrition factor – ns, M – meat consumption, N – obesity as a risk factor of diseases development, O – quality of fat used as spread on bread

shared varied dietary habits which was also related to the way of perceiving their body image through the aspect of fashion. Those surveyed in cluster I and IV tried to be fit and fashionable in their own perspective, basing their diet on eating fruits and vegetables. Preferences for high-fat diet were observed among the individuals from cluster II and III, which were compensated not only by eating higher quantities of fruits and vegetables (cluster II and III) but also by taking slimming medications (cluster II). Correspondingly, the surveyed individuals chose the "average" (cluster II) and "plump" silhouette (cluster III) as the ideal and most related to the real one. The lowest attention to the quantity and quality of meals was put by those from cluster V. High-fat, frequent meals (more than five per day) combined with small quantity of fruits and vegetables eaten, contributed to the development of excessive body fat as compared to other examined groups.

DISCUSSION

The results obtained in the study confirm earlier reports of a growing percentage of overweight adolescents in Poland. The surveyed population was numerous and uniform as far as sex and age are concerned. Therefore, the obtained data are reliable and bring valuable information contributing to the overview of Polish adolescents.

As documented in the present study, more than 10% of adolescents struggle with overweight and over 1% with obesity. In comparison to the majority of European countries the percentage of overweight and obese adolescents is still lower [WHO. Global nutrition data banks 2009]. On the contrary, the percentage of male overweight population in Lithuania, Slovakia, Estonia and the Netherlands is not higher than in Poland [Schneider 2000]. The percentage of overweight or obese adolescents in selected parts of the world is significantly higher. It was documented that 18.8% of adolescents in Mexico were overweight and nearly 40% of adolescents from the Pacific Islands were overweight and 36% obese [Ramirez-Lopez et al. 2001, Grant et al. 2008]. On the other hand, we have to bear in mind that a significant percentage of adolescents in South America is malnourished, reaching 16% of male teenage population in Brasil, and 31% in Chile. In some African and Asian countries the percentage of severely malnourished children is still frighteningly high [Sawaya et al. 1995, El-Sahn 1992, Wang et al. 1998]. As documented in the present study the epidemiological situation in this respect in Poland is not good either.

The comparison of results obtained in the population of Japanese males with a similar value of BMI to that observed in the group of Polish boys, showed that the % FM was higher among Japanese individuals [Kagawa et al. 2007]. This fact suggest that estimation of % FM based on BMI value in adolescents may be ethnically conditioned and shows limited application. Moreover, as shown NHANES III, ethnicity must be taken into consideration while analysing WC, as Mexican-American boys were documented to have higher values in the considered percentiles than African-Americans and European-Americans [Fernandez et al. 2004]. WHR and WC values in the present study were normal and higher than those reported by Stolzenberg et al. [2007].

The analysis of nutritional habits in different European countries points not only to the existence of a significant variability but also to exceeding of fat and monosaccharide consumption and low dietary fiber intake [Kersting et al. 1998, Perl et al. 1998, Hurson

and Corish 1997]. Cluster analysis depicted the specific group of subjects consuming meals frequently, being on a high-fat diet with small amount of fruits and vegetables. Review of existing evidence [Feunekes et al. 1998, Neumark-Sztainer et al. 1999] shows that a change of eating habits should affect the family as a whole, as nutritional intervention limited to the teenager only, may fail.

As documented in the present study overweight and obese boys perceived themselves thinner, than they were in reality. However, studied subject mostly chose as an ideal the "average" silhouette, which may suggest dissatisfaction with their own body. It was previously documented that body "dissatisfaction" in boys is a matter of feeling "too thin" and not "too fat" [Neumark-Sztainer et al. 1999]. Danubio et al. [2008] presented a similar point of view, stating that prevention of obesity is difficult to implement, especially since male adolescents show a tendency to perceive themselves as taller and slimmer than they are in reality. Wang et al. [1998] documented body weight dissatisfaction in over 15% of males, with only 37.7% of adolescents being dissatisfied with BMI $\geq$ 85th percentile and half with obesity (BMI $\geq$ 95th percentile). Kagawa et al. [2007] demonstrated that males with BMI below 18.5 kg/m^2 perceived themselves as "light". Among those with an "average" BMI value, 43% perceived themselves correctly and 41% underestimated their actual body mass. As documented in the present study, approximately 20% of the studied male subjects perceived themselves as "average" despite possessing a considerable amount of body fat. Bronner et al. [1999] confirms that almost half of studied subjects who were overweight chose a body image that did not represent their actual size. Xie et al. [2010] and Nichols et al. [2009] pointed to the fact that overweight predicted body image dissatisfaction, suggesting that it can be a cause of lower self-esteem, or even depressive symptoms.

CONCLUSIONS

Abnormal body weight is a frequent finding in Polish male adolescents. Obese and overweight boys underestimate their level of fatness and perceive themselves as "average" despite possessing an excessive amount of body fat. It seems that dietary habits, nutritional status and perception of own silhouette tend to "cluster".

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STAN ODŻYWIENIA, ZWYCZAJE ŻYWIENIOWE A POSTRZEGANIE SYLWETKI PRZEZ MŁODZIEŻ MĘSKĄ

Wstęp. Parametry antropometryczne dostarczają wielu informacji o składzie ciała i stanie odżywienia, bez względu czy ocena dotyczy otyłości, czy też niedożywienia. Celem pracy była ocena związku pomiędzy stanem odżywienia, zwyczajami żywieniowymi a postrzeganiem sylwetki ciała wśród polskiej młodzieży męskiej.

Materiał i metody. Wybrana populacja pierwotnie obejmowała 322 chłopców w wieku 17-18 lat z zachodniej Polski, z czego 30 badanych nie ukończyło badania. Ocena antropometryczna dotyczyła pomiaru: wysokości i masy ciała, czterech fałdów skórno-tłuszczowych, obwodów talii, bioder i mięśnia ramienia. Obliczono procentową zawartość tkanki tłuszczowej i powierzchnię mięśnia ramienia. Do oszacowania częstości oraz jakości spożywania posiłków i sposobu postrzegania sylwetki przez badanych wykorzystano autorski kwestionariusz. Zastosowano analizę skupień w celu określenia podobieństw zwyczajów żywieniowych i parametrów antropometrycznych chłopców.

Wyniki. Średnie wartości wysokości i masy ciała były zbliżone do 50 percentyla. Stwierdzono jednak, że 10,7% chłopców było niedożywionych, 10,7% miało nadwagę, a 1,3% otyłość. Odnotowano tendencję do niedoszacowania zawartości tkanki tłuszczowej wśród badanych z nadwagą i otyłością. Ponad 90% badanych uważała „przeciętną" sylwetkę za idealną.

Wnioski. Polska młodzież z nadwagą i otyłością wykazuje tendencję do niedoszacowania zawartości tkanki tłuszczowej, postrzegając siebie jako „przeciętnych", pomimo nadmiernej ilości tkanki tłuszczowej.

Słowa kluczowe: młodzież, zwyczaje żywieniowe, pomiary antropometryczne, postrzeganie sylwetki