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Evaluation of Nutritional Status of Male Population from Mining Vocational Schools in the Lublin Coal Basin*

Ocena stanu odżywiania populacji chłopców z zawodowych szkół górniczych Lubelskiego Zagłębia Węglowego

The basic nutritional mistake in Polish population at considerably rare deficiency of proteins and calories is incorrect composition of diet with the excess of animal fat and carbohydrates. Social and economic changes which influence living conditions result in the change of diet whose trends are not always correct. The problem is the quality of food products, contamination of pollution due to industrialization and the use of chemicals in agriculture, and inadequate proportion in the essential food components or supply of the indispensable trace elements. The other problem is overnutrition leading to obesity which is one of risk factors in civilization diseases (8, 11).

The nutritional status depends on the level of education and economic situation of different social groups. It is expected that among the pupils of vocational mining schools who usually come from numerous peasant and working class families nutritional mistakes may occur very often. It denotes both malnutrition and incorrect proportion in consumption of proteins, animal fats and carbohydrates. On the other hand, the expected changes in social and economic status due to a good job create new conditions for proper nutrition. An additional factor which should be taken into account are nutritional requirements resulting from specific character of underground work.

The aim of this paper is a preliminary evaluation of state of nutrition of boys starting their training in vocational mining schools in the Lublin Coal Basin area and, on this basis, creating a special preventive programme which will correct the observed nutritional mistakes and introduce the rational nutritional habits to the future miners.

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MATERIAL AND METHODS

The 886 boys aged 14—17 years starting their training in the Lublin Coal Basin vocational mining schools were examined. In all the boys the following measurements were taken: 1) skinfold thickness at the triceps, subscapular and supra-illiac areas; 2) height without footwear; 3) body weight in light clothes. The skinfold thickness was measured by Harpender caliper exact to 1 mm on the right side of the body with the subject standing in a relaxed condition according to the method described by Wolański (9). The height was measured exact to 0.5 cm, and the body weight exact to 0.1 kg. Physical development and nutritional status were established on the basis of Wolański's proportion nets between body weight and height (10). From measurements of skinfold thickness the whole body density was calculated according to the modified Durnin and Rahamon equation (3):

$$\text{Density} = 1.1533 - 0.0643 \times \log(1.7 \times \text{sf1} + \text{sf2} + \text{sf3})$$

where: sf1, sf2 and sf3 — skinfold thickness at triceps, subscapule and supra-illiac areas.

The percentage of body fat tissue was calculated according to Siri (6).

RESULTS

Mean values of height, weight, skinfold thickness and body fat tissue content in age groups of boys are presented in Table 1. Substantial differences in the growth and weight of the subjects are characteristic of this age and may be considered normal. No essential differences between the mean skinfold thickness

Table 1. The body height and weight, skinfold thickness and body fatty tissue in boys from vocational mining schools (mean ±SD)

Age years	N	Height cm	Weight kg	Skinfold thickness (mm)			Fatty tissue	
				Triceps	Scapula	Abdomen	%	kg
14	8	160.4 ±8.1	47.3 ±5.2	8.13 ±5.38	7.94 ±3.20	7.13 ±3.64	15.7 ±5.9	7.49 ±3.14
15	624	167.9 ±7.0	57.8 ±8.9	8.57 ±3.31	7.00 ±2.62	8.40 ±5.10	17.4 ±4.0	10.28 ±3.78
16	197	170.9 ±7.4	61.3 ±8.4	8.41 ±2.70	8.05 ±2.48	8.19 ±3.37	17.5 ±3.4	10.88 ±3.30
17	29	171.9 ±7.1	62.5 ±7.7	8.93 ±2.32	6.67 ±2.11	8.85 ±2.94	18.5 ±2.8	11.59 ±2.87
	858	168.7 ±7.2	58.7 ±8.9	8.54 ±3.27	7.94 ±3.20	8.35 ±4.69	17.4 ±3.9	10.43 ±3.67

and the body fat were found while in the whole population and in specific age groups a wide range of evaluated measurements was observed. Distribution of height, weight, summarized skinfold thickness and the body fat percentage are presented in Figs. 1—4. In 36 pupils (4%) the height below 155 cm was observed, in 56 (6.3%) the body weight was below 45 kg. Only in 28 boys (3.2%) the body fat content exceeded 25% of body weight. As it has been presented in Fig. 5 there is a significant correlation between the body weight and a body fat content and no correlation between the content of body fat and the height.

Nutritional indices and physical development of investigated boys have been presented in Table 2. Almost 70% of boys have been placed in the medium group in which the proportion between the body weight and height are considered

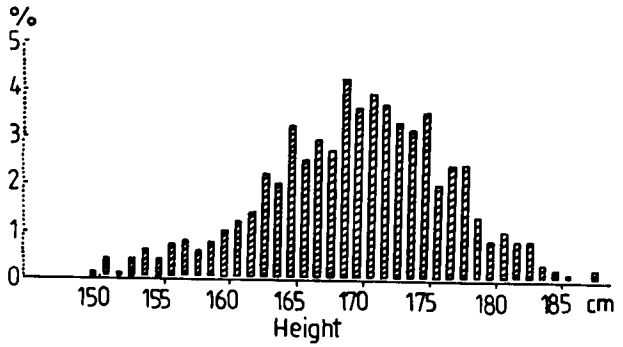

Fig. 1. Distribution of body height in pupils from vocational mining schools of Lublin Coal Basin

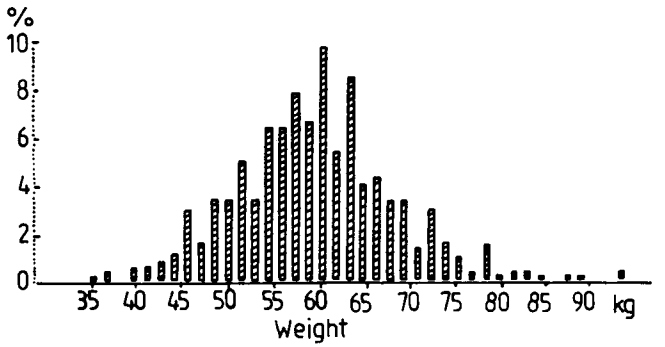

Fig. 2. Distribution of body weight in pupils from vocational mining schools of Lublin Coal Basin

average. No emaciated boys were found in the studied group but 1.8% reveal signs of obesity. In the investigated population somatotypes described as full or very full were more common than thin and very thin. When comparing the differences between the chronological age and developmental age in about 10% moderate retardation of development has been observed and in about 6% of boys insignificant acceleration of physical development.

DISCUSSION

The earlier studies coming from the country regions of the Lublin District show considerable differences in height and body weight. There is also a considerable difference in the physical development. One of the causes of this condition may be the period of puberty when the individual differences in the physical development of the boys of the same chronological age are the greatest. On the other hand, genetic determination and environmental influence may also play some role. According to Bielicki et al. (1), environmental and regional differences are still observed among youths and they may result from differentiated social and economic conditions, which in turn influence the nutritional

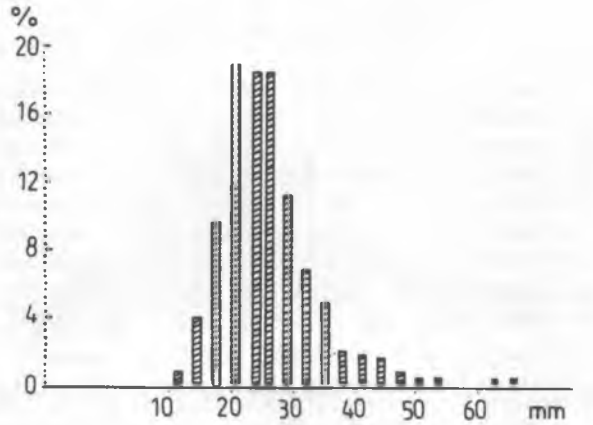

Fig. 3. Distribution of summarized skinfolds thickness (triceps + scapule + abdomen) in population of boys from vocational mining schools of Lublin Coal Basin

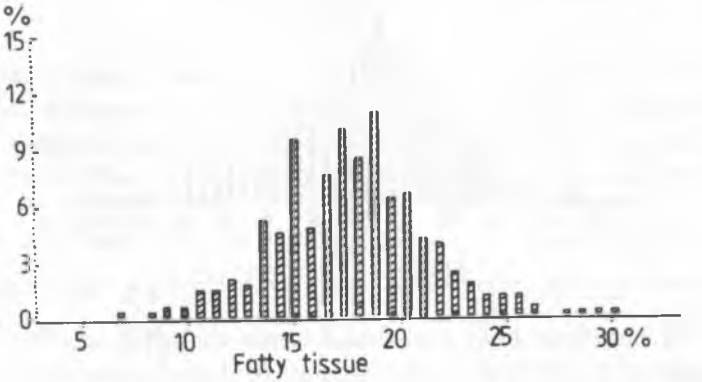

Fig. 4. Distribution of the body fatty tissue content in population of boys from vocational mining schools of the Lublin Coal Basin

status important for the future physical development and maturity of the young boys. Differences between chronological and biological age are taken as the rate of slowing down or acceleration of development and are variously treated by different authors (2). Permitting differences not exceeding 2 years 16.7% of boys are beyond this range in our investigations. In this group only about 6% reveal acceleration of development while more than 10% seem to be slowed down in a moderate degree. These results are slightly worse than those found in other regions of Poland (1, 5, 10). The nutritional status may be evaluated on the basis of some anthropometric indices, body composition and some biochemical parameters (5, 7, 10). On the basis of ratio of height to the body weight among the studied pupils of mining schools about 68% of boys have been classified in a group where nutritional status is considered as average. Among the remaining

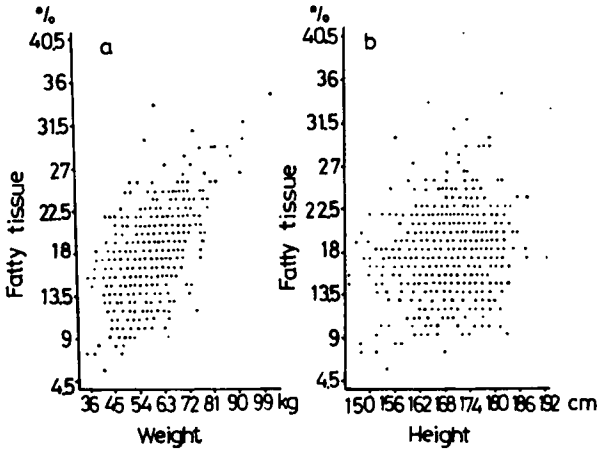

Fig. 5. Relationship between the body fat percentage; a — body weight ($r=0.558$), b — body height ($r=0.17$)

Table 2. Nutritional status and physical development of boys from vocational mining schools of the Lublin Coal Basin

Age years	Nutritional status												Development					
	V. thin		Thin		Average		Thick		V. thick		Obese		Acceler.		Normal		Retarded	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
14	—	—	—	—	6	85.7	1	14.3	—	—	—	—	—	—	6	85.7	1	14.3
15	1	0.2	32	4.9	457	70.5	119	18.4	29	4.5	10	1.5	33	1.5	568	87.7	47	7.3
16	1	0.5	14	6.9	124	61.4	40	19.8	18	8.9	5	2.5	22	10.9	148	73.3	32	15.8
17	—	—	1	3.4	21	72.4	5	17.2	2	6.9	—	—	1	3.4	16	55.2	12	41.4
	2	0.2	47	5.3	608	68.6	165	18.6	49	5.5	15	1.7	56	6.3	738	83.3	92	10.4

boys the "full" somatotypes occur fourfold more often than "thin" or "very thin" ones. Slightly different results are observed on the basis of analysis of skinfold thickness and fatty tissue content. In the studied group the above mentioned values are lower than those reported by other Polish authors (4, 7, 11). For example the average percentage of body fat in pupils of Lublin mining schools is 17.5% while in 16-year-old pupils in Łódź it is above 19%. In 7.1% of boys from our region the body fat is below 12% and only in 3.5% it constitutes 25% of the body weight. However, just before puberty spurt in boys decrease in body fat growth is observed. The obtained results indicate that the nutritional status of candidates to vocational mining schools from the Lublin District is not satisfactory, especially taking into account training for the hard job which requires considerable physical fitness.

Conclusions

1. In the population of boys aged 14—17 years beginning their training in the Lublin Coal Basin vocational mining schools significant differences between chronological and biological age, as well as in physical development are observed.

2. The results of skinfold thickness measurements, the body fat content and some developmental indices seem to indicate that the nutritional status of boys from the Lublin region is worse than that in the other regions of Poland.

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STRESZCZENIE

U 886 chłopców w wieku 14—17 lat, rozpoczynających naukę w zasadniczych szkołach górniczych Lubelskiego Zagłębia Węglowego, wykonano pomiary wzrostu i wagi ciała, grubości trzech fałdów skórno-tłuszczowych oraz wyliczono względną i bezwzględną zawartość tkanki tłuszczowej. Przeprowadzone badania wykazały, że w populacji chłopców występują znaczne różnice pomiędzy wiekiem kalendarzowym i rozwojowym, a także różnice w stopniu zaawansowania rozwoju fizycznego. Na podstawie pomiaru fałdów skórno-tłuszczowych i względnej zawartości tkanki tłuszczowej można przypuszczać, iż stan odżywienia młodzieży podejmującej naukę w szkołach górniczych LZW jest nieco gorszy niż młodzieży męskiej w analogicznym wieku z innych regionów Polski.