

CHANGES IN THE INCIDENCE OF UNDERWEIGHT AND OVERWEIGHT IN CHILDREN AND ADOLESCENTS FROM RURAL AREAS

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ABSTRACT

Research background and hypothesis. Considering the socio-economic transformations affecting the life style of rural families of Eastern Poland, it seemed worthwhile determining changes in the frequency of occurrence of overweight and underweight among girls and boys from this region, as the negative effects of improvements in life conditions include an increase in overweight and obesity, which in some countries takes the form of epidemics.

Research aim was to determine changes over time in the frequency of occurrence of underweight and overweight (including obesity) among children and adolescents in Eastern Poland considering social variation.

Research methods. Information was obtained applying a questionnaire survey concerning the educational level of parents and the number of children in the family. The standards recommended by the International Obesity Task Force were used for the evaluation of underweight and overweight including obesity, based on the BMI index.

Research results. During the period of time between 1998 and 2007, an increase was observed in the frequency of occurrence of overweight and obesity, accompanied by a decrease in underweight among boys. In girls, an opposite trend was noted – an increase in the number of underweight girls and a decrease in the frequency of occurrence of overweight and obesity. In addition, social differences were noted concerning BMI values: girls and boys with overweight and obesity most often came from families with lower levels of parental education and a larger number of children in the family.

Conclusions and perspectives. The education of parents and the number of children, in spite of observed social and economic positive changes in Poland, still have an influence on the frequency of occurrence of overweight and obesity in children and the youth of the rural areas.

Keywords: body mass index, time changes, social conditions.

INTRODUCTION

The eastern provinces belong to the poorest regions of Poland and their GDP (Gross Domestic Product) per capita is under 40% of the average GDP of the European Union (GUS, 2007). Most inhabitants of these regions live in rural areas and agriculture is their main source of income. The poor financial condition of most households, along with the difficult situation of employment

and low rates of education, constitute the basic problems faced by these regions of Poland. At the onset of the 21st century, nearly 60% of the rural inhabitants possessed elementary or incomplete elementary education level. Only 13.4% of farmers had a secondary school or university level of agricultural education compared to the national average of 21.4% (Niećko et al., 2001).

For the rural areas of Eastern Poland, entering the European Union clearly meant changes for the better. These areas obtained considerable financial support for development. A gradual increase was also observed with respect to levels of education for the inhabitants of this region; however, this level still remains below the national average (Bański et al., 2010).

The negative effects of these improvements in life conditions include an increase in the frequency of occurrence of overweight and obesity, which has been noted in recent years and in some countries takes the form of epidemics (WHO, 1998). Due to the appearance of a greater variety of high calorie meals and drinks on the market, combined simultaneously with an increase in physical inactivity, a considerable growth in the BMI index among Polish children and adolescents has been noted over the last years (Chrzanowska et al., 2007). On the other hand, in every population there is a group of children and adolescents with a deficiency of body mass. It is usually assumed that the cause of malnutrition is poverty; however, this may also result from the lack of adequate nutritional habits, lack of sufficient care, poor family life, or family pathology (Bennett et al., 2010). Other causes for this phenomenon may include strong social pressure of the media favoring the fashion of slim figures, which consequently leads to volitional nutritional limits among young girls.

Considering the socio-economic transformations affecting the life style of rural families on the verge of the 21st century, it seemed worthwhile to determine changes in the frequency of occurrence of overweight and underweight among girls and boys from this region during the period of time between 1998 and 2007 considering social diversity.

RESEARCH METHODS

Selection of the sample. Research materials were collected in two study series covering the years 1998 and 2007 as part of research project P05D 02314 and statutory studies DS.69. These studies were cross-sectional in character and included girls and boys aged 10 to 18, attending rural elementary, junior, and secondary schools in the Lubelskie Province (Eastern Poland). Schools participating in the study were selected at random from a list of all schools in this area made available by the Local Education Authority.

The schools selected constituted from 1.68 to 2.40% of the total number of schools in the region. The study was planned so as to include all children whose parents expressed consent for their children to participate. Ultimately, the study included data concerning 963 boys and 984 girls in 1998 (approximately 90% of the total number of children from the schools selected), and 800 boys and 639 girls in 2007 (about 75%). The studies were conducted by the authors of the presented report. The study protocol was approved by the Local Bioethical Committee of the University of Physical Education in Warsaw.

Methods. The study started with a survey among parents who provided data concerning, among other things: the date of birth of each child, education level of the mother and the father, and number of children in the family. The children were qualified to specified age categories based on their date of birth and the date of the survey. In both study series (1998 and 2007), measurements of basic somatic traits were performed including the measurements of height and body mass using the Martin technique (Martin, Saller, 1957). Based on these parameters, the BMI index was calculated then. This index was used to establish the incidence of underweight and overweight (including obesity) based on cut off values of BMI for children and adolescents recommended by the International Obesity Task Force (Cole et al., 2000; Cole et al., 2007). This enabled the demonstration of changes in the frequency of occurrence of underweight and overweight (including obesity) in the study series compared. Within the aforementioned groups of underweight and overweight subjects, we calculated the percentage of children from families where the parents had obtained elementary, vocational, secondary, and university levels of education. The statistical significance of the differences between the results obtained over the years examined was assessed by means of the χ^2 test. Similar calculations were performed while analyzing the percentage distribution of the participants in the study according to the number of children in the family (one child, three children, three or more children). All calculations were performed with the use of Statistica 7 (StatSoft® Poland) software.

RESEARCH RESULTS

Underweight and overweight (including obesity) according to gender and age. The

Table 1. Frequency of occurrence of underweight and overweight including obesity in boys during the period of 1998–2007

1998						Age, years	2007						Chi-square test – χ^2
Underweight		Normal BMI value		Overweight and obesity			Underweight		Normal BMI value		Overweight and obesity		
n	%	n	%	n	%		n	%	n	%	n	%	
10	9.6	86	82.7	8	7.7	10	14	15.1	72	77.4	7	7.5	1.36
17	15.3	79	71.2	15	13.5	11	6	5.9	77	76.2	18	17.8	5.31
19	16.1	82	69.5	17	14.4	12	7	9.2	61	96.0	8	10.5	3.00
20	15.7	94	74.0	13	10.2	13	5	3.6	93	66.4	42	30.0	25.10**
12	10.7	95	84.8	5	4.5	14	1	1.4	54	73.0	19	25.7	23.29**
9	12.2	59	79.7	6	8.1	15	8	7.5	81	75.7	18	16.8	3.76
4	3.8	94	90.4	6	5.8	16	1	1.0	79	78.2	21	20.8	12.01**
12	11.4	85	81.0	8	7.6	17	1	1.9	47	87.0	6	11.1	5.70
8	7.4	96	88.9	4	3.7	18	1	1.9	47	87.0	6	11.1	5.39
111	11.5	770	80.0	82	8.5	Total	44	5.5	611	76.4	145	18.1	50.91**

Note. * – statistically significant differences at the level $p < 0.05$; ** – statistically significant differences at the level $p < 0.01$.

Table 2. Frequency of occurrence of underweight and overweight including obesity among girls during the period of 1998–2000

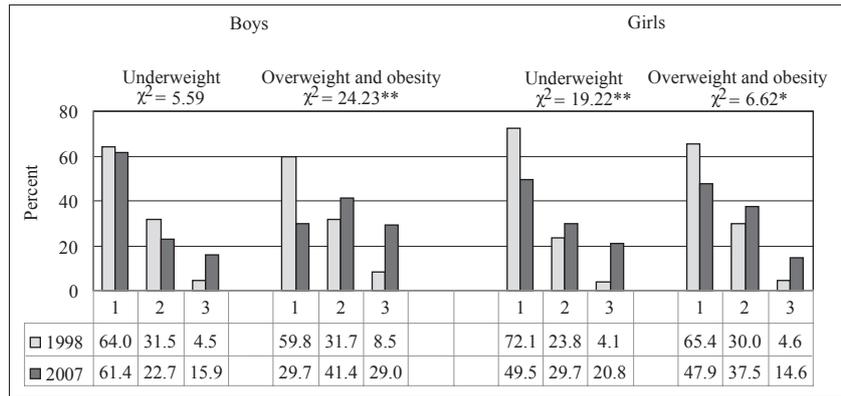
1998						Age, years	2007						Chi-square test – χ^2
Underweight		Normal BMI value		Overweight and obesity			Underweight		Normal BMI value		Overweight and obesity		
n	%	n	%	n	%		n	%	n	%	n	%	
12	12.5	71	74.0	13	13.5	10	11	13.6	55	67.9	15	18.5	0.95
20	18.3	75	68.8	14	12.8	11	8	14.0	36	63.2	13	22.8	2.78
27	24.5	72	65.5	11	10.0	12	2	5.4	33	89.2	2	5.4	9.43**
15	13.4	82	73.2	15	13.4	13	11	15.9	54	78.3	4	5.8	2.89
16	13.8	85	73.3	15	12.9	14	9	12.7	58	81.7	4	5.6	2.96
8	8.8	69	75.8	14	15.4	15	7	9.5	66	89.2	1	1.4	11.83**
4	3.3	98	81.0	19	15.7	16	22	22.9	70	72.9	4	4.2	26.15**
12	9.8	95	77.9	15	12.3	17	13	23.6	40	72.7	2	3.6	8.36*
8	7.5	84	78.5	15	14.0	18	18	18.2	78	78.8	3	3.0	12.59**
122	12.4	731	74.3	131	13.3	Total	101	15.8	490	76.7	48	7.5	15.96**

Note. * – statistically significant differences at the level $p < 0.05$; ** – statistically significant differences at the level $p < 0.01$.

analysis of the frequency of occurrence of underweight and overweight (including obesity) in boys in 1998 showed that the percentage of those underweight was higher than of those overweight and obese. Deviations from normal BMI values were the greatest among boys aged from 11 to 13.

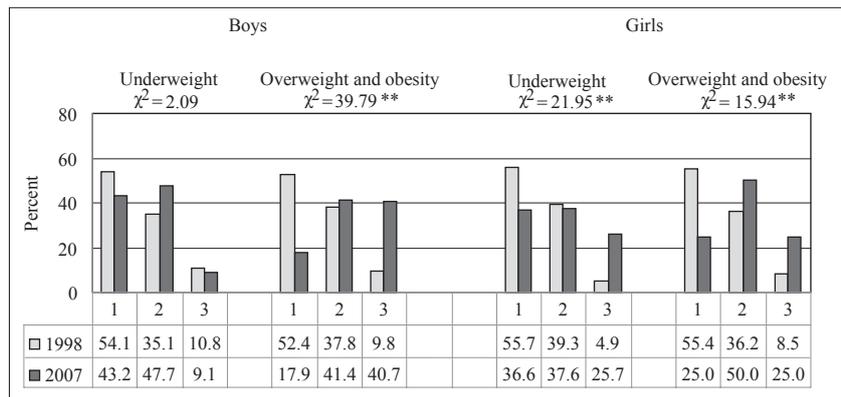
When comparing the above-mentioned data to the studies conducted in 2007, we observed a decrease in the percentage of underweight boys (from 11.5% down to 5.5%). Also, a significant increase was noted in the percentage of overweight and obese boys (from 8.5% up to 18.1%). The changes

Figure 1. Frequency of occurrence of underweight and overweight including obesity according to the education level of the father



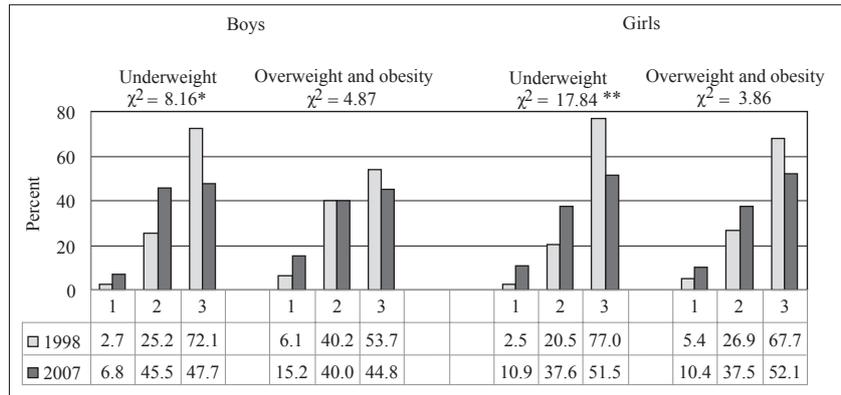
Note. * – statistically significant differences on the level $p < 0.05$; ** – statistically significant differences on the level $p < 0.01$. Education level: 1 – elementary + vocational, 2 – secondary, 3 – university.

Figure 2. Frequency of occurrence of underweight and overweight including obesity according to the education level of the mother



Note. * – statistically significant differences on the level $p < 0.05$; ** – statistically significant differences on the level $p < 0.01$. Education level: 1 – elementary + vocational, 2 – secondary, 3 – university.

Figure 3. Frequency of occurrence of underweight and overweight including obesity according to the number of children in the family



Note. * – statistically significant differences on the level $p < 0.05$; ** – statistically significant differences on the level $p < 0.01$. Number of children: 1 – one child, 2 – two children, 3 – three and more children.

observed in the incidence of underweight and overweight (including obesity) were statistically significant over this period of time (Table 1).

In 1998, a higher percentage of underweight and overweight (including obese) girls was observed in comparison to boys. In addition, it was noted that the percentage of girls who were underweight and overweight (including obese) was similar, amounting to 12.4 and 13.3%, respectively. Underweight girls were most frequently noted in younger age categories, i. e. 10 to 14 years of age. In the subsequent study series (2007), an increase was noted in the incidence of underweight, whereas the percentage of overweight and obese girls decreased nearly twofold. In addition, it was observed that underweight was most typical of girls in the oldest age categories (16 to 18 years

of age). The chi-square test (χ^2) confirmed the presence of statistically significant differences, mainly in the older age categories (Table 2).

Education level of parents. A clear relationship was observed between the incidence of underweight and overweight (including obesity) among the participants and the educational level of their parents. In 1998 the highest percentage of children examined with deviations from normal BMI values was noted in those families where fathers and mothers had elementary or vocational education. For children coming from families with higher levels of parental education, the situation was different. Children from these families constituted the smallest percentage of study subjects in regards to both underweight and overweight (including obesity) subjects.

In 2007, this situation slightly changed – boys with underweight and overweight (including obesity) most often came from families where the parents had secondary education. Girls who had BMI values which were too low or too high came from families where the father had elementary or vocational education while the mother had secondary education. At the same time, compared to data from 1998, an increase was noted in the percentage of children with underweight and overweight (including obesity) whose parents had university education (Figures 1, 2).

Number of children in a family. Figures 5 and 6 present the frequency of occurrence of underweight and overweight (including obesity) in boys and girls according to the number of children in the family. Both underweight and overweight cases (including obesity) were relatively rarely observed in families with a single child. Deviations from normal BMI values were most often found in children coming from families with many children. This situation was noted both in 1998 and 2007. Nevertheless, in 2007 when comparing children coming from families with two, three or more children, differences in the frequency of occurrence of deviations from normal BMI values decreased. Statistically significant differences between the study series analyzed were noted only in the case of underweight boys and girls (Figure 3).

DISCUSSION

The presented results of studies concerning rural children and adolescents from Eastern Poland indicate that the frequency of occurrence of overweight and obesity is increasing on the verge of the 21st century, which is in accord with a worldwide tendency (Frye, Heinrich, 2003; Lobstein et al., 2003). In Poland, this phenomenon has also been observed with varying intensity according to gender, age, and place of residence (Chrzanowska et al., 2007; Zawodniak-Szałapska et al., 2007). Simultaneously, the phenomenon of girls losing weight in early adolescence also occurs (Popławska et al., 2006; Chrzanowska et al., 2007), which was also confirmed by the results of our own studies.

The occurrence of exceedingly low body mass and low fatness among girls after puberty is probably the effect of slimming diets used in order to adjust to the existing fashion of having a slim figure. In general, underweight was found in 12% of boys and 14% of girls in Poland (in half of these

children, this deficiency was to a considerable degree) (Szponar et al., 2003). This problem also occurred among children and adolescents from the studied region. However, a decrease was observed during this time period (1998–2007) in the frequency of occurrence of underweight among boys from this area.

Studies to-date have shown that abnormal body mass, irrespective of genetic determination, is socially and culturally determined (Hardy et al., 2000). In Polish studies, the socio-economic situation of a family is most often determined by two variables, i. e. the level of education of the parents and the number of siblings. These factors can be easily and objectively identified; also, these criteria may be applied when comparing the results of our own studies with the results of other researchers.

The category of parental level of education encompasses a synthetic view concerning the home conditions of a child. Parents with higher levels of education and greater pedagogical awareness may create conditions for their offspring which are more conducive for their development. At the same time, T. Bielicki et al. (2005) suggest that the effects of parental education on a child's development cannot exclusively refer to the relationship between education and income, but are rather the reflection of the management of home finances, which exerts a positive effect on the development and health of a child of better educated parents.

S. Kozieł et al. (2000) observed that children of parents with 'low' categories of education are at higher risk of obesity. However, studies conducted by E. B. Bodzsár (1999) in Hungary showed the opposite relationship: overweight and obesity were most often found in boys and girls whose parents had the highest levels of education. Our studies confirm that during this period (1998–2007), there was indeed a change in the conditioning model in regards to relative body mass and this socio-cultural factor. In 1998, both underweight and overweight children most frequently came from families with the lowest levels of parental education. Nevertheless, in association with the upward tendency of the level of education of the whole of society, the percentage of children from families where the fathers and the mothers possessed secondary or university education increased in 2007. Simultaneously it has been observed that overweight and obese children most

often came from families where the mothers had secondary education.

The second indicator of differences in living conditions between various social groups is the number of children in the family. It is commonly known that the larger the number of children, the lower the income per one family member, which, in effect, qualitatively and quantitatively limits the mode of nutrition, and therefore results in an increase in body mass. High, statistically significant relationships between the size of a family and the level of fatness in British children were observed by E. Duran-Tauleria et al. (1995), as well as in Hungarian children by O. G. Eiben and C. G. Mascie-Taylor (2004). Studies by Polish researchers confirm that an increase in family size is accompanied by a decrease in the frequency of occurrence of overweight and obesity in children (Kozieł et al., 2000). In our studies, an opposite relationship was observed meaning that overweight

and obese children and adolescents most often came from families with many children. A similar situation was noted with respect to underweight children. This is probably associated with the fact that families with three or more children prevail in the rural areas of Eastern Poland. In a family with many children, the parents may not always be able to fully satisfy the basic nutritional needs of a child, which may be reflected by deviations from normal body mass.

CONCLUSION AND PERSPECTIVES

The education of parents and the number of children, in spite of observed social and economic positive changes in Poland, still have an influence on the frequency of occurrence of overweight and obesity in children and the youth of the rural areas.

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VAIKŲ IR PAAUGLIŲ ANTSVORIO IR NEPAKANKAMO SVORIO PAPLITIMO KAITA KAIMO VIETOVĖSE

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SANTRAUKA

Tyrimo pagrindimas ir hipotezė. Vertinant socialinius ir ekonominius pokyčius, keičiančius šeimų gyvenimo būdą Rytų Lenkijoje, verta patyrinėti berniukų ir mergaičių nepakankamo svorio ir antsvorio paplitimą šiame regione: teigiami gyvenimo sąlygų pokyčiai turi ir neigiamų pasekmių – antsvorio ir nutukimo atvejai kai kuriose šalyse jau įgavo epidemijos formą.

Tikslas: nustatyti, kaip kinta Rytų Lenkijos vaikų ir paauglių nepakankamo svorio ir antsvorio (taip pat ir nutukimo) paplitimo dažnumas per tam tikrą laiką, įvertinant ir socialinius pokyčius.

Metodai. Taikant apklausos metodą buvo renkama informacija apie tėvų išsilavinimą ir vaikų skaičių šeimoje. Nepakankamas kūno svoris ir antsvoris buvo įvertintas pagal Tarptautinės kovos su nutukimu darbo grupės parengtas rekomendacijas, kurios remiasi KMI vertinimu.

Rezultatai. Nuo 1998 iki 2007 metų pastebimas berniukų antsvorio ir nutukimo atvejų pagausėjimas, nepakankamo svorio atvejų mažėja. Visiškai priešinga tendencija pastebima tarp mergaičių – pagausėjo nepakankamo svorio atvejų, sumažėjo antsvorio ir nutukimo atvejų. Nustatytos socialinių veiksnių ir KMI indekso reikšmių sąsajos: antsvoris ir nutukimas būdingas tiems berniukams ir mergaitėms, kurių tėvai turi mažesnę išsilavinimą ir kurių šeimose auga daugiau vaikų.

Išvados ir perspektyvos. Nepaisant pastebimų teigiamų socialinių ir ekonominių pokyčių Lenkijoje, tėvų išsilavinimas bei vaikų skaičius šeimoje turi įtakos vaikų ir paauglių antsvorio, nutukimo paplitimui kaimo vietovėse.

Raktažodžiai: kūno masės indeksas, laiko pokyčiai, socialinės sąlygos.

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