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PARENTAL PERCEPTION OF BODY WEIGHT IN PRESCHOOL CHILDREN AND AN ANALYSIS OF THE CONNECTION BETWEEN SELECTED PARENT-RELATED FACTORS AND THE ASSESSMENT OF THEIR CHILDREN'S WEIGHT

POSTRZEGANIE PRZEZ RODZICÓW MASY CIAŁA DZIECI PRZEDSZKOLNYCH ORAZ ANALIZA ZWIĄZKÓW WYBRANYCH CZYNNIKÓW RODZICIELSKICH Z PRZEPROWADZONĄ OCENĄ MASY CIAŁA

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Abstract

Introduction: *The efforts parents make to maintain the correct body weight in children indicates parental awareness of overweight and obesity-related health risks.*

Aim: *The objective of the analysis was to define the accuracy of the appraisal of weight-to-height proportions in preschool children, as assessed by their parents and to analyse the connection of selected parental factors with the assessment conducted.*

Material and methods: *Data were collected from 230 children (121 males and 109 females aged 6.28 ± 0.56 years) attending preschools in the city of Wrocław, Poland. Body height and weight were measured to calculate BMI; cut-offs referenced by the International Obesity Task Force were used to determine weight status (underweight, overweight, obese). The participants' parents completed a weight-height assessment of their child and provided information on how often the child's body weight was checked. Cohen's kappa coefficient was used as a statistical measure of inter-rater agreement between actual child weight and parental perception of child weight. Selected parental factors influencing the correctness of assessing child body weight was tested using the chi-square test.*

Results: *This study showed that 42.1% of underweight children and 60.9% overweight and obese children are perceived as having normal weight.*

In the group of children with normal weight-to-height proportions, 13.3% of the parents declared their normal-weight children to be underweight.

No relationship was found in the study between the correct assessment of body weight and the parents' own body weight, their education, or such factors as sex and the frequency of checking the child's body weight.

Conclusions: *The incompatibility between actual and perceived weight status indicates the need for health education among parents in assessing and monitoring the child's body weight during the developmental period.*

Key words: child, body mass index, parental perception, weight status, weight perception

Streszczenie

Wprowadzenie: *Troska rodziców o utrzymanie prawidłowej masy ciała dziecka, wskazuje na świadomość rodzicielską dotyczącą zagrożeń zdrowotnych związanych z nieprawidłową masą ciała.*

Cel: Celem badań było rozpoznanie trafności oceny proporcji wagowo-wzrostowych dzieci przedszkolnych dokonanej przez ich rodziców oraz analiza związków wybranych czynników rodzicielskich z dokonaną oceną.

Materiał i metody: Materiał obejmuje dane dotyczące 230 dzieci z publicznych przedszkoli we Wrocławiu tj. 121 chłopców i 109 dziewcząt w wieku 6 lat ($6,28 \pm 0,56$)

U dzieci dokonano pomiarów wysokości i masy ciała. Obliczono BMI, którego wartość oznaczono zgodnie z International Obesity Task Force (IOTF) uwzględniając punkty graniczne dla nadwagi, otyłości oraz niedowagi. Rodzice badanych dzieci dokonali oceny wagowo-wzrostowych proporcji ciała własnego dziecka oraz udzielili informacji o częstotliwości kontroli masy ciała dziecka. Do analizy zgodności oceny masy ciała dziecka dokonanej przez rodziców z rzeczywistym jej stanem wykorzystano współczynnik kappa Cohena. Wpływ wybranych czynników rodzicielskich na poprawność oceny masy ciała dziecka sprawdzono testem chi-kwadrat.

Wyniki: Badania wykazały, że 42,1% dzieci z niedowagą i 60,9% dzieci z nadwagą i otyłością jest postrzeganych przez rodziców w kategoriach właściwej masy ciała.

W grupie badanych o prawidłowych proporcjach wagowo-wzrostowych, 13,3% rodziców uznało prawidłową masę ciała dziecka za niedowagę.

Badania nie potwierdziły, że na zgodność oceny masy ciała dzieci przedszkolnych mogą mieć wpływ takie czynniki jak status masy ciała i wykształcenie rodziców oraz płeć i częstotliwość kontroli masy ciała dziecka.

Wnioski: Rozbieżność między rodzicielską oceną masy ciała dziecka a jej rzeczywistą wartością, wskazuje na potrzebę edukacji rodziców w zakresie metod oceny masy ciała i konieczności jej monitorowania w okresie rozwoju.

Słowa kluczowe: dziecko, wskaźnik masy ciała, ocena rodzicielska, status masy ciała, postrzeganie masy ciała.

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INTRODUCTION

The increasing rate of overweight and obesity in people of different ages constitutes an important problem [1]. Excessive body mass significantly increases the risk of chronic diseases, which negatively affect the quality of human life [2, 3, 4]. An equally important problem associated with body mass is its deficiency, which is commonly known as underweight. The low body mass of a child most often indicates the insufficient supply of nutrient substances. Chronic malnutrition during the stage of development results in disorders in the proper development and differentiation of a young organism [5]. Solicitude to maintain proper body mass should be undertaken as soon as early childhood, because the results of examinations prove that obesity acquired in the first years of life is a contributor to the risk of overweight in adult years [6, 7].

Amongst the most important predictors of body mass are family factors [8]. For a child, the family is the first and basic environment, which influences his or her health and development until full maturity is reached. In the first years of a child's life, the family demonstrates a strong shaping influence on nutrition and physical activity [9]. Parental perception of a child's body mass may, therefore, play a key role in decisions associated with the adopted lifestyle.

Test results show that parents have difficulties in the correct assessment of their children's body mass [10,

11, 12], which may prove their low awareness of health threats associated both with high and low body mass. It is also indicated that in the group of younger children, their body mass is far more erroneously perceived than amongst school children and adolescents [10, 11, 13].

The objective of the analysis was to define the accuracy of the appraisal of weight-to-height proportions in pre-school children, as assessed by their parents and to analyse the relationships of selected parental factors with the conducted assessment.

MATERIAL AND METHODS

The material covers data concerning 230 children (121 boys and 109 girls) aged 6 ($6,28 \pm 0,56$) attending public pre-schools in Wrocław. The tests were conducted at the Biokinetics Laboratory of the University School of Physical Education in Wrocław, which holds a certificate of the quality management system ISO 9001:2001. The caregivers of the children examined gave their written consent to participate in the tests, and the plan of the experimental research was approved by the Senate Ethics Committee for Scientific Research of the University of Physical Education in Wrocław, Poland.

The children were subject to measurements of basic somatic parameters. Body height was measured with the use of an anthropometre; the head of the subject was set in the Frankfurt plane, and the measurement results were recorded with an accuracy of up to 0.1 cm. Body

mass was determined with the use of an electronic scale (error of measurement up to 100 g) with accuracy up to 0.1 kg. The data acquired concerning body height and mass were used to calculate the Body Mass Index (BMI), the value of which was determined in accordance with the International Obesity Task Force (IOTF), taking into consideration threshold limits for overweight, obesity and underweight [14, 15].

The parents of the children examined were asked, e.g., to assess the weight-to-height proportions of the child's body and to control the body mass. The following questions were asked:

How would you describe your child's body mass?

(select one answer: a. significant underweight, b. slight underweight, c. normal body mass, d. slight overweight, e. significant overweight).

Parental assessment made it possible to determine three groups of children: a. underweight (significant and slight underweight), b. normal body weight, and c. overweight (significant and slight overweight).

Data on the parents' education, the parents' own body weight, and the frequency of controlling the child's body weight were obtained by questionnaire.

The self-reported frequency of parental weight control was dichotomized as either regular (at least once every 3 months) or occasional (once or twice per year, or not at all).

The basic descriptive statistics was calculated for all the variables and included the mean, median, standard deviation, and minimum and maximum values.

The compliance of parental perception with the status quo of the child's body mass was assessed based on Cohen's kappa coefficient. It was assumed that non-compliance would be indicated by the values $\kappa < 0.80$.

The influence of the selected parental factors (the mother's and father's weight status and education, the frequency of the child's body mass control) on the correctness of the child's body mass assessment was verified by the chi-square test. The results were recognised as statistically significant for $p < 0.05$.

RESULTS

The descriptive characteristics of the somatic structure of boys and girls are presented in table I.

Children with normal body weight represent 81.7% of the 6-year-olds examined (fig. 1). Excessive body weight was found in 10% of the examined children, whereas overweight was found in 8.2% and obesity in 1.7% of the examined subjects. Children with insufficient body weight, the so called underweight, represent a total of 8.3% of all those examined, of which 7.4% represent the first, slight thinness grade.

The study showed the differences in the parental perception of weight-to-height proportions of their children as compared to their actual body mass status (tab. II).

The highest accuracy of body mass assessment was observed in the group of children with normal weight-to-height proportions. In this group 86.7% of the children correctly assessed their own child's body mass. 13.3% of the parents believed that their child's body mass was too low, in spite of the child's correct weight-to-height proportions.

In the group examined, 57.9% of the parents made a correct assessment of their child's body mass, where the BMI index showed underweight. On the other hand in the case of pre-schoolers with overweight or obesity, only 39.1% of the parents correctly assessed their child's body mass.

Over two-thirds of the children with regular parental control of body weight ($n=165$) presented normal weight which was correctly assessed by the parents. Among the group whose body weight was occasionally controlled ($n=65$), approximately 8% and 5% were underweight and overweight, respectively.

The acquired Cohen's kappa coefficient values from low to moderate ($0.273 < \kappa < 0.462$) indicate non-compliance between parental perception and actual child body mass, depending on the child's gender, parental body mass and education, and the frequency of making body mass control measurements (tab. II).

Table I. Characteristics of the children examined.

Tabela I. Charakterystyka badanych dzieci.

Somatic parameters <i>Parametry somatyczne</i>	Boys <i>Chłopcy</i> ($n=121$)			Girls <i>Dziewczęta</i> ($n=109$)		
	$\bar{x} \pm SD$	min.	max.	$\bar{x} \pm SD$	min.	max.
Body height [cm] <i>Wysokość ciała</i>	119.4 \pm 6.86	105.0	138.0	119.9 \pm 6.16	106.4	132.2
Body mass [kg] <i>Masa ciała</i>	22.5 \pm 3.73	15.6	36.5	22.4 \pm 4.02	15.4	37.4
BMI [kg/m ²] <i>Wskaźnik Masy Ciała</i>	15.7 \pm 1.44	13.1	21.0	15.6 \pm 1.65	11.9	22.1

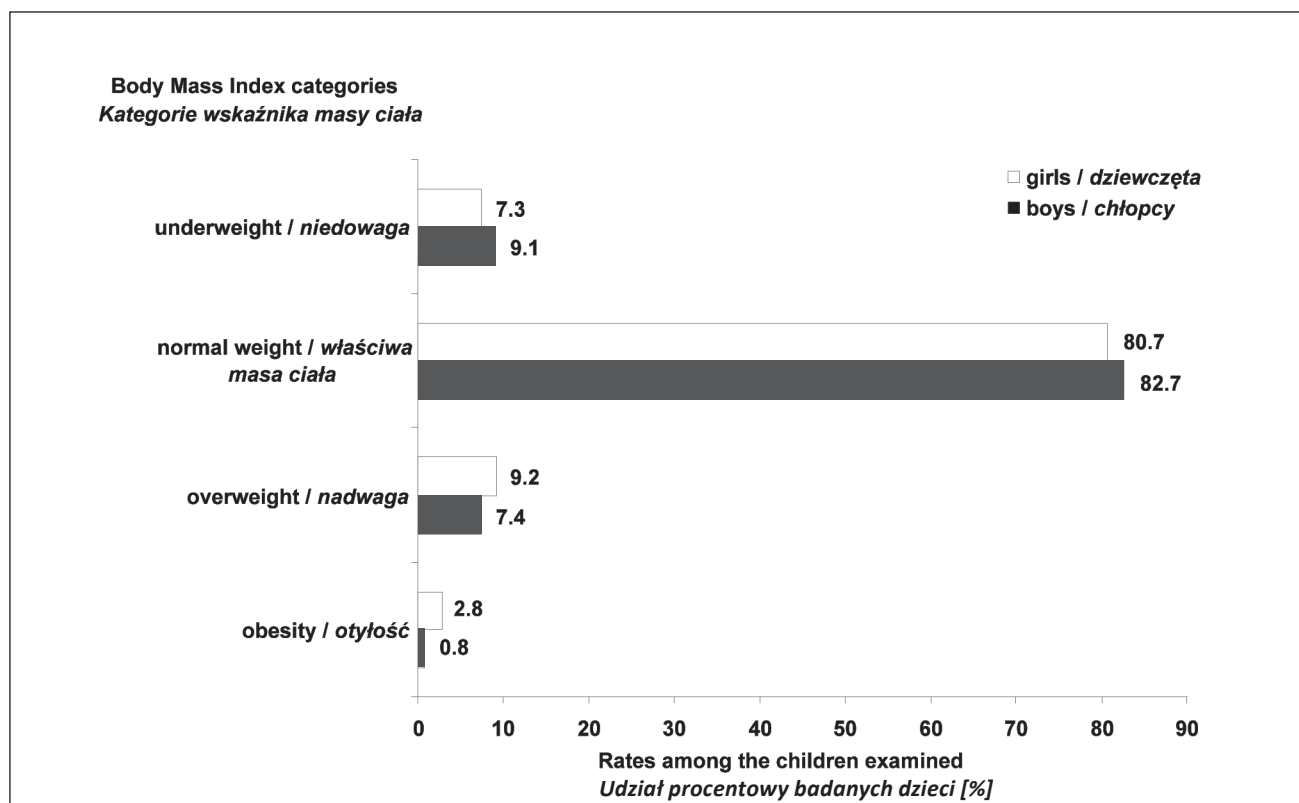


Fig. 1. Distribution of sample by sex and BMI categories.

Ryc. 1. Kategoria BMI u badanych dzieci w zależności od płci.

Table II. Parental perception of body weight status and parental factors, including their own weight, their education, and the frequency of checking their child's body weight.

Tabela II. Zgodność statusu masy ciała dziecka z oceną dokonaną przez rodziców i wybranymi czynnikami rodzicielskimi takimi jak proporcje wagowo-wzrostowe i wykształcenie oraz częstość kontroli masy ciała dziecka.

Parental perception of body weight: underweight, normal weight, overweight and obesity <i>Masa ciała dziecka</i> w ocenie rodziców w kategoriach: <i>niedowaga, właściwa masa ciała,</i> <i>nadwaga i otyłość</i>	Child weight status <i>Status masy ciała dziecka</i>			Cohen's Kappa coefficient <i>Współczynnik kappa Cohena</i>
	Underweight <i>Niedowaga</i> n (%)	Normal Weight <i>Właściwa masa ciała</i> n (%)	Overweight and Obesity <i>Nadwaga i Otyłość</i> n (%)	
Total/Ogółem (n=230)				0.373**
Underweight/ <i>Niedowaga</i>	11 (57.9)	25 (13.3)	0	
Normal weight/ <i>Właściwa masa ciała</i>	8 (42.1)	163 (86.7)	14 (60.9)	
Overweight and Obesity/ <i>Nadwaga i Otyłość</i>	0	0	9 (39.1)	
Children's gender <i>Płeć</i>				
Girls/Dziewczęta (n=109)				0.366**
Underweight/ <i>Niedowaga</i>	4 (50.0)	10 (11.4)	0	
Normal weight/ <i>Właściwa masa ciała</i>	4 (50.0)	78 (86.6)	8 (61.5)	
Overweight and Obesity/ <i>Nadwaga i Otyłość</i>	0	0	5 (38.5)	
Boys/Chłopcy (n=121)				0.377**
Underweight/ <i>Niedowaga</i>	7 (63.6)	15 (15.0)	0	
Normal weight/ <i>Właściwa masa ciała</i>	4 (36.4)	85 (85.0)	6 (60.0)	
Overweight and Obesity/ <i>Nadwaga i Otyłość</i>	0	0	4 (40.0)	

Table II. cont.

Tabela II. cd.

Mother's weight <i>Masa ciała matki</i>				
Normal weight/Właściwa masa ciała (n=199)				0.391**
Underweight/Niedowaga	10 (62.5)	21 (12.7)	0	
Normal weight/Właściwa masa ciała	6 (37.5)	144 (87.3)	11(61.1)	
Overweight and Obesity/Nadwaga i Otyłość	0	0	7 (38.9)	
Overweight and obesity/Nadwaga i Otyłość (n=31)				0.273*
Underweight/Niedowaga	1 (33.3)	4 (17.4)	0	
Normal weight/Właściwa masa ciała	2 (66.6)	19 (82.6)	3 (60.0)	
Overweight and Obesity/Nadwaga i Otyłość	0	0	2 (40.0)	
Father's weight <i>Masa ciała ojca</i>				
Normal weight/Właściwa masa ciała (n=89)				0.431**
Underweight/Niedowaga	6 (75.0)	11 (14.9)	0	
Normal weight/Właściwa masa ciała	2 (25.0)	63 (85.1)	4 (57.1)	
Overweight and Obesity/Nadwaga i Otyłość	0	0	3 (42.9)	
Overweight and obesity/Nadwaga i Otyłość (n=129)				0.336**
Underweight/Niedowaga	5 (45.5)	13 (12.8)	0	
Normal weight/Właściwa masa ciała	6 (54.5)	89 (87.3)	10 (62.5)	
Overweight and Obesity/Nadwaga i Otyłość	0	0	6 (37.5)	
Mother's level of education <i>Poziom wykształcenia matki</i>				
Tertiary/Wyższe (n=189)				0.354**
Underweight/Niedowaga	9 (56.3)	21 (13.6)	0	
Normal weight/Właściwa masa ciała	7 (43.7)	133 (86.4)	12 (63.2)	
Overweight and Obesity/Nadwaga i Otyłość	0	0	7 (36.8)	
Secondary/Średnie (n=41)				0.462**
Underweight/Niedowaga	2 (66.7)	4 (11.8)	0	
Normal weight/Właściwa masa ciała	1 (33.3)	30 (88.2)	2 (50.0)	
Overweight and Obesity/Nadwaga i Otyłość	0	0	2 (50.0)	
Father's level of education <i>Poziom wykształcenia ojca</i>				
Tertiary/Wyższe (n=161)				0.343**
Underweight/Niedowaga	7 (50.0)	16 (12.3)	0	
Normal weight/Właściwa masa ciała	7 (50.0)	114 (87.7)	11 (64.7)	
Overweight and Obesity/Nadwaga i Otyłość	0	0	6 (35.3)	
Secondary/Średnie (n=69)				0.441**
Underweight/Niedowaga	4 (80.0)	9 (15.5)	0	
Normal weight/Właściwa masa ciała	1 (20.0)	49 (84.5)	3 (50.0)	
Overweight and Obesity/Nadwaga i Otyłość	0	0	3 (50.0)	
Parental control of the child's weight <i>Kontrola masy ciała dziecka</i>				
Regular/Regularna (n=165)				0.358**
Underweight/Niedowaga	7 (50.0)	20 (15.3)	0	
Normal weight/Właściwa masa ciała	7 (50.0)	111 (84.7)	11 (55.0)	
Overweight and Obesity/Nadwaga i Otyłość	0	0	9 (45.0)	
Occasional/Sporadyczna (n=65)				0.408**
Underweight/Niedowaga	4 (80.0)	5 (8.8)	0	
Normal weight/Właściwa masa ciała	1 (20.0)	52 (91.2)	3 (100)	
Overweight and Obesity/Nadwaga i Otyłość	0	0	0	

*p<0.05

**p<0.001

Table III. Comparison between correct and incorrect classification of body weight by parents in relation to actual weight status and selected parental factors.

Tabela III. Porównanie poprawnej i błędnej klasyfikacji masy ciała dziecka dokonana przez rodziców względem rzeczywistego stanu masy ciała oraz wybranych czynników rodzicielskich.

	Parental assessment of their child's weight <i>Masa ciała dziecka w ocenie rodziców</i>		χ^2 test	
	Correct <i>Poprawna</i> n (%)	Incorrect <i>Błędna</i> n (%)	Test value <i>Wartość testu</i>	p-value <i>Wartość p</i>
Child weight status <i>Masa ciała dziecka</i>				
Underweight/ <i>Niedowaga</i>	11 (57.9)	8 (42.1)	34.506	0.000
Normal weight/ <i>Właściwa masa ciała</i>	163 (86.7)	25 (13.3)		
Overweight and Obese/ <i>Nadwaga i Otyłość</i>	9 (39.1)	14 (60.9)		
Children gender <i>Płeć</i>				
Girls/ <i>Dziewczęta</i>	87 (79.8)	22 (20.2)	0.008	0.929
Boys/ <i>Chłopcy</i>	96 (79.3)	25 (20.7)		
Child weight control <i>Kontrola masy ciała dziecka</i>				
Regularly/ <i>Regularna</i>	127 (77.0)	38 (23.0)	2.419	0.120
Occasionally/ <i>Sporadyczna</i>	56 (86.1)	9 (13.9)		
Mothers' weight status <i>Status masy ciała matki</i>				
Normal weight/ <i>Właściwa masa ciała</i>	161 (80.9)	38 (19.1)	1.629	0.202
Overweight and obese/ <i>Nadwaga i Otyłość</i>	22 (80.0)	9 (19.0)		
Fathers' weight status <i>Status masy ciała ojca</i>				
Normal weight/ <i>Właściwa masa ciała</i>	72 (80.9)	17 (19.1)	0.361	0.548
Overweight and obese/ <i>Nadwaga i Otyłość</i>	100 (77.5)	29 (22.5)		
Mothers' education level <i>Poziom wykształcenia matki</i>				
Tertiary/ <i>Wyższe</i>	149 (78.8)	40 (21.2)	0.347	0.556
Secondary/ <i>Średnie</i>	34 (82.9)	7 (17.1)		
Fathers' education level <i>Poziom wykształcenia ojca</i>				
Tertiary/ <i>Wyższe</i>	127 (78.9)	34 (21.1)	0.154	0.695
Secondary/ <i>Średnie</i>	56 (81.21)	13 (18.8)		

Table III presents the percentage share of correct and erroneous parental perceptions of a child's body mass. A statistically significant relationship between the accuracy of parental perception of a child's body mass and the actual status quo was observed, as defined based on the BMI index value classification.

The remaining variables concerning the frequency of a child's body mass control and the status of the mother's and father's body mass analysed on the basis of the BMI index value classification and on the parents' education did not indicate any relationship with the correctness of a child's body mass perception.

DISCUSSION

The parents' inability to estimate overweight, obesity or underweight in a child's early stages of life is an important problem, because it makes it impossible to undertake preventive activities, the objective of which is to counteract the occurrence of diseases related with body mass.

The results of our studies have shown that the parents of preschool-age children have difficulty in the correct assessment of their body mass, which is proven by low to moderate Cohen Kappa coefficient values. This problem was also confirmed by studies done by other authors,

who suggest that incorrect assessment of body mass is observed in the case of younger children [10, 11, 13].

According to our observations across the group of children who presented with confirmed overweight and obesity, as many as 60.9% of their parents incorrectly assessed their body mass, defining it as "normal weight". The results of examinations carried out in a group of Portuguese children aged 9 to 12 years, show a comparable percentage of parents (i.e. 61.6%) who make incorrect assessments of their child's body mass [12]. At the same time, studies conducted in the USA in a group of children aged 2 to 11 years, show that incorrect assessment of body mass in overweight and obese children is made by 35 to 50% of the parents [10, 11].

The results of research by Rhee et al. [16], show that parents who are aware of the improper body mass of their child, perceive it as a health-related problem, more frequently take decisions concerning the modification of the existing lifestyle of their entire family. Therefore, according to West et al. [17], the lack of parental awareness of their children's obesity should be classified as a health risk factor.

Based on the analysis of the results of our studies, the incorrect assessment of body mass was also observed in the group of children with correct BMI values, however this applied to a minor percentage of the subjects examined. More than 13% of the parents of children with correct body mass, incorrectly assessed the proportions of their child, perceiving the correct body mass as being too low.

At the same time, among the group of underweight children, as many as 42.1% of the parents did not see any irregularities in their children's body mass.

To compare, in the United States, amongst the population of pre-school and early school children, 44.5% of the mothers of underweight boys and 33.4% of the mothers of underweight girls, believed that their children's body mass was correct [10], while the results of research by Lopes et al. [12], conducted among Portuguese children aged 9-12 years, prove that as many as 65.2% parents did not see the problem of low body mass.

An attempt to recognise the factors associated with the accuracy of a child's body mass assessment made by his/her parents showed that such accuracy does not depend on the child's gender, the parents' own body mass and education, or the frequency of body mass control.

The results of our studies have proven the occurrence of increased body mass in every tenth 6-year-old. Excess body mass in the developmental period as a result of higher fatness is associated with many health effects.

It has been proven that overweight children differ from their peers with correct body mass, in terms of physical development [6, 18]. They are taller and grow up earlier, which increases the risk of obesity in adult years [19, 20]. Maintained overweight promotes the occurrence of many chronic diseases, such as type 2 diabetes, arterial hypertension, orthopaedic disorders, heart and cancer diseases [6, 21, 22].

Besides the consequences of being overweight and obese, which affect the physical development of children and young people, the negative effects on mental and social development are emphasised. These result from low self-esteem, social isolation from peers, and impaired

life quality related with a decrease of functional health [18, 23, 24].

The results of our study have shown that the occurrence of underweight cases is equally frequent as overweight or obesity. Too low a body mass was found in more than 8% of the children examined, and the inability to recognise this condition by 2/3 of the parents indicates the necessity to draw attention to the problem of underweight children: its range, causes and effects on the child's health and development.

CONCLUSION

1. The incompatibility between actual weight status as indicated by BMI and parental perception of weight shows the need to develop health education which would train parents to assess and monitor child body weight during this developmental period.
2. The study did not confirm the connection between a child's weight status, parental education, sex, or the frequency of checking the child's body weight and the correct assessment of a child's body weight.
3. The results of the present study demonstrate that the prevalence of underweight in preschool children is similar to overweight and obesity. This finding suggests the need to educate parents on the health risks associated with low body weight in children.

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