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Prevalence of respiratory defects, bad habits and oral dysfunctions in schoolchildren with overweight/obesity

Występowanie zaburzeń oddechowych, szkodliwych nawyków i dysfunkcji narządu żucia u dzieci szkolnych z nadwagą i otyłością

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ABSTRACT

Introduction. Overweight and obesity may be connected with some congenital diseases or with the imbalance of energy intake and its expenditure. In 1997 WHO defined obesity as a pandemic involving not only adults but also the population of children and adolescents. Obesity is supposed to be connected with different aspects of oral health (periodontitis, caries, xerostomia) and respiratory diseases.

Aim. The aim of the study is to investigate the occurrence of respiratory defects, bad habits and oral dysfunctions as impaired speech, chewing and swallowing, in the group of obese children in comparison with the group with proper BMI index.

Material and methods. 120 children aged from 7–15; 60 children with alimentary (simple) overweight/obesity including 26 girls and 34 boys (mean age 10 ± 10 months). The control group was composed of the same number of children adjusted by gender and age to the study sample.

Results and conclusions. Improper speech, swallowing and chewing prevalence in both groups was similar ($p = 0.547$). Parafunctions (bad habits) occurrence was higher in overweight group ($p = 0,067$) however without statistical difference. Upper respiratory problems were statistically more prevalent in the overweight group ($p = 0.023$ with coefficient $C = 0,203$).

Keywords: overweight, obesity, upper airway disorders.

STRESZCZENIE

Wstęp. Nadwaga i otyłość mogą być związane z wrodzonymi zespołami chorobowymi lub z brakiem równowagi między ilością dostarczonej energii i jej wydatkowaniem. W 1997 roku WHO określiło otyłość jako pandemię obejmującą nie tylko dorosłych, lecz także populację dzieci i młodzieży. Otyłość jest uważana za przyczynę problemów związanych ze zdrowiem jamy ustnej (zapalenie przyzębia, próchnica, suchość błony śluzowej) i chorobami dróg oddechowych.

Cel. Celem pracy jest zbadanie częstości występowania zaburzeń oddechowych, szkodliwych nawyków i dysfunkcji narządu żucia, takich jak nieprawidłowa mowa, żucie i połykanie w grupie dzieci z nadwagą i otyłością w porównaniu z dziećmi o prawidłowym BMI.

Material i metody. 120 dzieci w przedziale wiekowym 7–15 lat z nadwagą i otyłością prostą, w tym 26 dziewczynek i 34 chłopców (średni wiek 10 ± 10 miesięcy). Grupa kontrolna złożona była z tej samej liczby dzieci dostosowanej pod względem wieku i płci do grupy badanej.

Wyniki i wnioski. Nieprawidłowa wymowa, połykanie i żucie występowały z podobną częstością w obu grupach badanych ($p = 0,547$), a występowanie parafunkcji było częstsze w grupie dzieci z nadwagą ($p = 0,067$), jednak bez istotności statystycznej. Zaburzenia górnych dróg oddechowych występowały statystycznie częściej w grupie dzieci z nadwagą ($p = 0,023$ o współczynniku kontyngencji $C = 0,203$).

Słowa kluczowe: nadwaga, otyłość, choroby górnych dróg oddechowych.

Introduction

Overweight and obesity become an increasing problem in growing population all over the world due mostly to socioeconomic changes. In 1997

WHO claimed the obesity to be a global epidemic and this report remains still current [1, 2]. Excessive body mass index in growing period leads to deterioration of quality of life and higher morbidity

with increasing risk of adulthood obesity [3, 4]. In Poland childhood overweight is estimated to affect no more than 20% of growing population and obesity does not exceed 5% placing this country at a medium level in comparison with other European populations [5, 6, 7, 8]. Epidemiological investigations are not homonymous and are performed according to different standards: International Obesity Task Force IOTF, World Health Organisation WHO, or national / regional norms. However most reports show the dynamic increase of the overweight and obesity over the last three decades.

The influence of childhood overweight/obesity on oral health has been investigated for many years. The connection with caries is still controversial from positive to negative correlation [9, 10, 11, 12]. The growth spurt timing and skeletal age especially in girls display differences and this fact has implications also on jaws development [13, 14, 15].

Obese children and adolescents have a changed morphology of facial and oral soft and hard tissue [16, 17]. The shape and position of teeth and jaws is influenced by function of masticatory muscles during speech, chewing, swallowing and by way of breathing; may be altered sometimes by deleterious bad habits [18, 19, 20, 21]. The functional aspects of occlusion in the abovementioned group were investigated.

Material and methods

Among the numerous group of overweight and obese children from three schools of the city Poznan and from Health Resort for Children in Kudowa with different kinds of overweight/obesity it was chosen a study sample including 60 schoolchildren 7–15 years of age (mean age 10 ± 10), 26 girls and 34 boys. The control group consisted of

60 schoolchildren: 26 girls and 34 boys recruited from the same schools and Resort, adjusted in respect of age to the test sample. The inclusion criteria for the test group was simple alimentary overweight and obesity. Genetic syndromes, neural or endocrinologic disorders, chronic drugs intake or a history of previous orthodontic treatment were excluding criteria.

Every patient and his/her parents were well informed about the investigation and gave a written consent. The Bioethics Committee from Medical University of Poznan approved the project study.

The weight and height of each child were measured. The BMI Index (kg/m^2) calculated, the national percentile charts of BMI elaborated by Institute of the Mother and Child in Warsaw were chosen as investigation tool.

Data were derived from two sources:

1. questionnaire filled out by parents and children, with questions about previous or current respiratory disorders (recurrent tonsillitis, frequent rhinitis, asthma, respiratory allergies, sleep disorders with snoring, obstructive sleep apnea or hypopnea, adeno — and/or tonsillectomy), about bad habits (finger sucking, nail or pens biting, lips sucking, nocturnal teeth grinding), diet (soft or varied diet). All questions were closed.
2. clinical trial supported by medical photographic documentation. Lip competence, speech, tongue thrust during swallowing and teeth grinding were assessed.

The chi-square test was used. Patients were described with qualitative variables, where an occurrence of a given feature was marked as 1 and lack of it as 0. Tests were considered as significant statistically if p was less than level of significance

Table 1. Connection between overweight/obesity and upper airway disorders

Tabela 1. Związek między nadwagą / otyłością a zaburzeniami górnych dróg oddechowych

Weight	Amount		Total
	Upper respiratory diseases		
	Lack of diseases	Upper respiratory diseases present	
Normal BMI	44	16	60
Overweight/obesity	32	28	60
Total	76	44	120
Weight	Frequency		Total
	Upper respiratory diseases		
	Lack of diseases	Upper respiratory diseases present	
Normal BMI	36,7	13,3	50,0
Overweight/obesity	26,7	23,3	50,0
Total	63,3	36,7	100,0

Correlation, $p = 0,023$; [$p < 0,05$], $C = 0,203$; weak correlation

Table 2. Occurrence of oral habits in both groups**Tabela 2.** Występowanie nawyków ustnych w obu grupach

Weight	Amount		Total
	Bad habits		
	Lack of bad habits	Bad habits prevalence	
Normal BMI	38	22	60
Overweight/obesity	28	32	60
Total	66	54	120
Weight	Frequency		Total
	Bad habits		
	Lack of bad habits	Bad habits prevalence	
Normal BMI	31,7	18,3	50,0
Overweight/obesity	23,3	26,7	50,0
Total	55,0	45,0	100,0

Correlation: $p = 0,067$; [$p > 0,05$]

Table 3. Oral dysfunctions in both groups**Tabela 3.** Zaburzenia jamy ustnej w obu grupach

Weight	Amount		Total
	Oral dysfunctions		
	Lack of dysfunctions	Oral dysfunctions prevalence	
Normal BMI	44	16	60
Overweight/obesity	41	19	60
Total	85	35	120
Weight	Frequency		Total
	Oral dysfunctions		
	Lack of dysfunctions	Oral dysfunctions prevalence	
Normal BMI	36,7	13,3	50,0
Overweight/obesity	34,2	15,8	50,0
Total	70,8	29,2	100,0

Correlation: $p = 0,547$; [$p > 0,05$]

$\alpha = 0.05$ in which case the second step was to assess the contingency coefficient C .

Results

Upper respiratory disturbances were stated in 47% of overweight/obese children with alimentary overweight/obesity in relation to 27% in the control sample. The difference between overweight/obese and normal weight children reaches statistical significance ($p = 0.023$) with the contingency coefficient $C = 0.203$ (**Table 1**).

Among all parafunctions in both groups the most widespread was finger sucking and nail biting, less frequently lip sucking, pencil biting and teeth grinding. The difference between the two groups shows no statistical significance ($p = 0.067$) however bad habits were observed in 55% overweight / obese and 37% normal weight children (**Table 2**).

The incidence of oral dysfunctions in the both group did not display statistical difference, with similar results in overweight and normal weight children (**Table 3**).

Discussion

Etiology of malocclusions is an outcome of two main factors connected in a reciprocal interdependent relationship: morphological and functional. The amount of environmental impact depends on genetic determinants connected with facial skeleton and neuromuscular congenital pattern [22]. The reaction of an individual to external stimulus depends on his ecosensitivity, adaptability, and also on the external force amount and its timing. The younger the individual the greatest effectivity of external stimulus. Overweight children and adolescents have a changed morphology of facial and oral soft and hard tissue. The shape and position of teeth and jaws is

also influenced by function of masticatory muscles during speech, chewing, swallowing and breathing and may be altered sometimes by deleterious bad habits. We investigated the functional aspects of occlusion in the above-mentioned group.

Many investigations confirmed more frequent respiratory disturbances in obese patients:

- › obstructive sleep apnea or hypopnea resulting from narrowing of upper respiratory airway due to fat deposits in the neck, cheeks and tongue
- › higher incidence of asthma and allergies
- › higher incidence of tonsils hypertrophy and local inflammatory processes [23–28].

Wing et al. described sleep respiratory disorders in one third of obese children aged 7–15 years and only few percent percent in the control group [29]. The relationship between overweight/obesity and respiratory disturbances has been proved also in this study.

The respiratory pattern belongs to the most significant external etiological factors influencing occlusion development. Mouth breathing may alter the posture of the tongue and of the mandible leading to its posterior rotation, produce increased overjet and narrowing of maxilla. Especially maxillary reduced intercanine, intermolar and interpremolar distances in OSA patients have been proven [30, 31, 32].

The bad habits incidence was higher in the overweight group without statistical difference ($p = 0.067$). There are some studies about psychological aspects of childhood obesity.

It is a supposed connection between chronic stress leading to depression, frustration, low self-esteem which may be both reason or result of obesity [33, 34]. Direct pressure of external deleterious force resulting from bad habits changes position of jaws or/and teeth altering functional equilibrium. The final negative result correlates mostly with number of hours per day of exerting bad habit.

Oral dysfunctions such as tongue thrust swallowing, bad positioning of the tongue connected with wrong articulation of sibilants and postdental consonants, lazy chewing connected with soft diet leading to lack of deciduous teeth grinding — were observed with similar frequency in both groups ($p = 0.547$). Their impact however on malocclusions prevalence in general is controversial.

Conclusions

Among all examined children with increased BMI there were chosen only children with alimentary overweight/obesity. Statistically significant differences in respiratory disturbances and greater number of overweight children expressing bad ha-

bits (however without statistical correlation) prove that those factors may presumably contribute to the higher occurrence of malocclusions in the overweight group.

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Conflict of interest statement

The authors declare that there is no conflict of interest in the authorship or publication of contribution.

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