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The impact of nutritional status on the incidence of back pain in school-aged children - a study using the Cole's index

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Keywords: Cole's index, children, abnormal nutritional status

ABSTRACT

Introduction: Disorders of nutritional status have a significant impact on the dysfunction of many body systems. Emerging evidence suggests that abnormal nutritional status has a significant impact on the occurrence of bone degeneration, joint damage and it leads to an increased occurrence of back pain. According to WHO, 36% of boys and 23% of girls among Polish teenagers are overweight. In contrast, protein-energy malnutrition may affect up to 13% of children.

The aim of the study: Anthropometric assessment of nutritional status and its impact on the frequency of back pain in school-age children.

Methods and materials: 241 people applied for the study (female = 141, male = 100) aged 10 to 17 years (average age=14 years ± 3 years). The examined people did not suffer from any chronic diseases, they were in general good health. Interviews have focused on the occurrence of back pain in the last 3 months and at the time of the study. During the physical examination, anthropometric measurements (body weight and height) were made. On their basis, the BMIs were calculated, which were compared to the 50th percentile (OLA, OLAF centiles) giving the Cole index. The Shapiro-Wilk tests, t-Student test, and U Mann - Whitney tests were used for statistical calculations.

Results: The incidence of pain in the presence of abnormal nutritional status is by 15.38 percentage points higher than in examined persons without abnormal nutritional status. However, the frequency of the absence of pain is by 8.94 percentage points lower in people with normal body mass. Nevertheless, no statistically significant differences were observed at the significance level of 0.05.

Conclusions: Based on statistical research, it seems that the abnormal nutritional status in school-aged children does not affect the increased incidence of back pain in this period. To confirm this observation, further research into a larger and more homogeneous group of subjects is recommended.

INTRODUCTION

Overweight and obesity is a significant health problem in the current population. Abnormal nutritional status and poor eating habits are the cause of many metabolic chronic diseases, which significantly affect the reduction of health and are often the cause of death (1). In addition to the adverse effects on the cardiovascular system, endocrine system, respiratory system and patient's self-esteem, malnutrition or obesity have an adverse effect on the musculoskeletal system. Increased body weight leads to degenerative joint changes and cartilage defects and secondary to pain and low quality of life (2). In contrast, malnutrition can lead to deficiencies in basic nutrients and secondary to bone changes, musculoskeletal pain and joint dysfunctions (3). However, this problem does not affect only adult patients. According to the 2009/2010 report of the World Health Organization, 36% of boys and 23% of girls among Polish teenagers are overweight (4). In addition, energy-protein malnutrition can affect up to 13% of children. This means that Poland has joined the group of countries in which the growing problem of disorders among children requires immediate counteraction, but also in-depth analyses of their impact on the functioning of the body and its various systems, including musculoskeletal system (3).

AIM OF THE STUDY

Anthropometric assessment of nutritional status and its influence on the frequency of back pain in school-age children.

MATERIAL AND METHODS

241 people applied for the study (female = 141, male = 100) between the ages of 10 and 17 (14 years ± 3 years). The survey took place in Lublin from October to December in 2017. For the study, written informed consent of parents or legal guardians was made. Excluding criteria: neurological diseases, spine injuries, recent surgeries, lack of cooperation with the child during measuring.

First, an anthropometric examination was carried out in the form of measuring the children's height and weight. After the measurements, an interview aimed at the occurrence of back pain in the last 3 months and at the time of the study was conducted.

The Cole’s index, also referred to as RBMI (Relative Body Mass Index), was used to assess the collected data. It is calculated from the formula: Cole’s index = (patient BMI / BMI for 50c) x 100% (1,5). BMI for 50 centiles was determined based on OLA centile charts, OLAF (6). The range of CI ranges is shown in Table 1.

Table 1. Classification of age ranges by Cole index

Interval	Nutritional status
<89%	Underweight
90-109%	Norm
110-119%	Overweight
> 120%	Obesity

Data analysis was carried out according to the following criteria:

1. Calculation of the Cole's index
2. Comparison of the prevalence of abnormal nutritional status along with back pain and healthy people and back pain.

The comparison of data was developed statistically and performed using the IBM SPSS STATISTICS 21 program. First, the normality of the variable distribution was verified using the Shapiro-Wilk test and the Kolmogorov-Smirnov test (with the Lilliefors amendment). In the case when at least one of the tested distributions deviated significantly from the normal one for U Mann-Whitney comparisons. In the case when the distributions did not differ from normality, Student's t-test for independent samples was used for comparisons of the significance of differences. Differences were considered statistically significant if the test probability level was lower than the assumed level of significance ($p < 0.05$).

RESULTS

Ad 1. Anthropometric Cole index results - Table 2.

Table 2. Results of the Anthropometric Cole Index

Age	Sex	n	Results of Cole's index			
			underweight <90%	**norm 90-110%**	**overweight 111-120%**	**obesity >120%**
total (% of n)	**f**	141	9 6,38%	75 53,19%	25 17,73%	32 22,70%
	m	100	1 1%	52 52%	20 20%	27 27%
Sum (% of n)		241	10 4,15%	127 52,70%	45 18,67%	59 24,48%

Ad 2. The incidence of pain at the co-occurrence of abnormal nutritional status is about 15.3 percentage points higher than in people without the disorder. However, the frequency of the absence of pain is by 8.94 percentage points lower in people with normal body mass. However, at the significance level of ≤0.05, no statistically significant differences were observed - Table 3.

Table 3. Compared statistical groups with disorders and lack of eating disorders and the occurrence of spinal pains

	n	No pain	Back pain	p
Nutritional status disorders	114	99	15	0,262
No nutritional status disorders	127	116	11	

DISCUSSION

The aim of the study was an anthropometric assessment of the nutritional status and its impact on the incidence of back pain in school-age children. The results showed no significant correlation between the nutritional status and the backbone pain.

The results of the presented study are in line with the results of Smith et al., they prepared a literature review in which they presented studies on children aged 2-18. According to their conclusions, there is no significant evidence indicating that abnormal nutritional status affects a development of musculoskeletal pain (7). The literature review conducted by Shiri et al. their results indicate that overweight and obesity increase the risk of low back pain. However, they conducted a review of research conducted on adults (2). Higher weight in the aetiology of back pain is emphasized by studies of Brady et al., They studied adult women (8). The latest work by Zhang et al. also confirms that overweight and obesity are risk factors for lumbar pain in men and women. Maintaining normal body weight may be one of the factors preventing the occurrence of the described pain (9). This may suggest that back pain in people with eating disorders can occur with age. When people with eating disorders deepen their dysfunctions, leading to obesity and reduced physical fitness and chronic pain (7). Children have a lower physical burden in relation to working people, which undoubtedly may contribute to the occurrence of the aforementioned ailments.

According to studies by Słowińska et al., in children with overweight, the incidence of pain, especially in the knee and foot joints, was significantly higher. The researchers did not find such an observation in relation to backache pains which is poor, confirmed the studies presented (10).

In Poland, the prevalence of overweight and obesity in children is on an average level (11). According to Health Behaviour in School-Aged Children (HBSC), overweight and

obesity occurred in 14.8% of all students aged 11-15 years (12). In the present study, overweight and obesity occurred in 43.15%. The above differences may be related to age-changing groups, in the presented study children aged 10-17 participated.

According to the 2009/2019 of World Health Organisation, in Poland 36% of boys and 23% of girls (aged 11) have an overweight problem (4). In the presented study, overweight was found in 20% of boys and 17.73% of girls. The results may have similar values, but the differences may result from the age of the subjects in both groups as well as the size of the study groups.

CONCLUSIONS

Based on statistical surveys, it seems that the abnormal nutritional status in school-age children does not affect the increased incidence of back pain in this period. To confirm this observation, further research into a larger and more homogeneous group of subjects is recommended.

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