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Analysis of body mass index in children with polyarticular hypermobility

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SUMMARY

Admission: Polyarticular hypermobility is joint mobility, defined as increased based on accepted standards. Structural changes resulting from the hypermobility arthritis could lead to significant disorders of the musculo-skeletal and others. Inadequate weight gain in children with joint hypermobility may be an additional factor that will be negatively affected locomotor system. Due to the consequences of hypermobility, it seems expedient to show students and their parents methods of prevention and rehabilitation of disorders in case of the emergence of health risks.

Objective: Analysis of the BMI distribution on centile charts of children with polyarticular hypermobility.

Material and method: The study was conducted in 100 children aged 6 to 11 years attending primary schools in Szczecin. In children made anthropometric measurements (height, weight, etc.) on the basis of which calculated the body mass index (BMI) and this values assigned to the corresponding centile charts sex and age. In order to determine the occurrence of joint hypermobility in children was carried out Modified Beighton Scale. Children with a positive test result in Beighton Scale constituted study group (Group I). The control group (Group II) included in a random fashion an equal number of boys and girls in the same age as the Group I in which the rated value of the BMI, and there were no joint hypermobility.

Results: In the group of 100 children, hypermobility of joints in Beighton Scale stawierdzono in 34% of the respondents (41,93% girls, 30,43% boys). Statistical evaluation BMI on the centile charts between the Group I and Group II showed no statistical significance (p = 0,88).

Conclusions: Value of BMI on the centile charts are comparable in children with hypermobility and children without occurring features hypermobility of joints. Given the prevalence of frequensy hypermobility among children and young people, prevention in the form of assessment of the hypermobility is very important.

Keywords: hypermobility, body mass index, centile chart, Beighton Scale**.**

ADMISSION

Hypermobility (also called laxity or excessive joint mobility), this is the mobility of joints, termed increased on the basis of the accepted norms. First time The Hypermobility Syndrome (ZHS - ang. Joint Hypermobility Syndrome) was described in 1967 by Kirk [1]. The main ZHS symptoms include: increased relative to normal mobility of joints, and ligaments laxity bags, ease joint dislocations and sprains, muscle and joint pain, stretchy skin, blurred vision, visceral disorders, disorders of stabilize the body. ZHS is observed mainly in people aged development, as well as in young adults (women three times more often than men) [2]. Symptoms of hypermobility most often show up before 15 years of age [3].

ZHS belongs to a group of genetic disorders involving defective genes encoding proteins matrices min. elastin and collagen. The connective tissue then becomes brittle and supple so that its properties are significantly impaired [6,7].

So far we failed to state clearly what is the direct cause of the disorder, but it is believed that the impact of factors are genetic, hormonal, immunological and environmental [8,9]. According to some authors hypermobility should not be considered as a separate disease entity but rather as a symptom of many diseases accompanying abnormalities e.g. Down's syndrome, Marfan syndrome, Ehler-Danlos syndrome, mild hypermobility syndrome [8].

Structural changes resulting from the ZHS could result in significant impairment of normal joint function. It was noted that hypermobility in children may be a cause of pain and musculoskeletal dysfunction and early degenerative changes in the joints of the spine in adulthood [10]. Given the increased tendency for disorders of the musculoskeletal in children with ZHS, it seems important to implement the preventive measures at an early stage dysfunction.

A factor that has a significant impact on the proper functioning of the musculoskeletal system, especially in people with hypermobility of the joints, is to maintain a normal body weight. The report of the International Obesity Task Force shows that every fifth child in Europe has a problem with maintaining a normal body weight [11]. The problem of overweight and obesity in children and adolescents is relatively new, but it quickly becomes a common problem and now significantly elevated body mass index (BMI - Body Mass Index) are recognized as a disease of civilization. Regardless of etiology, overweight and obesity leads to dysfunction including systems circulatory, respiratory, digestive and musculoskeletal. [12]. In addition, in children and

adolescents with a significantly higher body mass index observed many endocrine disorders, including type II diabetes. All these irregularities poorly treated or untreated will affect health in adulthood.

Equally dangerous is malnutrition in children. Too low a body mass index in childhood can have various causes, min. endocrine disorders, mental, chronic underlying diseases, genetic predisposition, or defects in the feeding [13]. Early diagnosis of malnutrition in children and adolescents is of particular importance due to the theirdynamic development of the body [14]. The consequences of malnutrition include, for example, muscle weakness, decrease in mobility, degenerative changes in the joints and internal organs, as well as significant growth disorders.

In the prevention of children's overweight, obesity and malnutrition most often uses two anthropometric indicators: height and weight of body. BMI calculation and determination of its position on the respective centile grids is very important in the study of preventive health in children and adolescents [15,16,17].

In children diagnosed with hypermobility of joints suitable weight value is particularly important and should be subject to continuous verification especially during growth of the organism. This fact has prompted the authors to raise the subject of the assessment of body mass index in children with hypermobility of joints.

OBJECTIVE

The aim of this study is to assess the value of the body mass index and its distribution on centile grids of children with polyarticular hypermobility.

MATERIALS AND METHODS

The study was conducted in the Primary School No. 16 and the No. 2 Primary School in Szczecin. The study involved a group of 100 children (31 girls, 69 boys) aged 6 to 11 years old. Guardians were informed about the purpose and gave written informed consent to participate in the study child. In each child made the basic anthropometric studies on the basis of which the body mass indices were calculated and the resulting value were assigned to the corresponding centile grid for age and sex (Fig. 1). The body mass index is a ratio resulting from dividing the weight [kg] by the square of body height [m2]. BMI results are only for adults, but when the

indicator is to be used in the diagnosis of children, calculated BMI have to be translated into the appropriate centile grid for age and sex of the child [15, 16,17]. The value of BMI defined as a weight deficiency in children and adolescents hovers below 5 percentile for age and sex. Overweight starts at the moment in which a body mass index corresponds to a value equal to or greater than 85 percentile, but less than the 95th percentile for age and sex. Obesity recognize only when the BMI corresponds to a value equal to or above 95 centile [19,18,17].

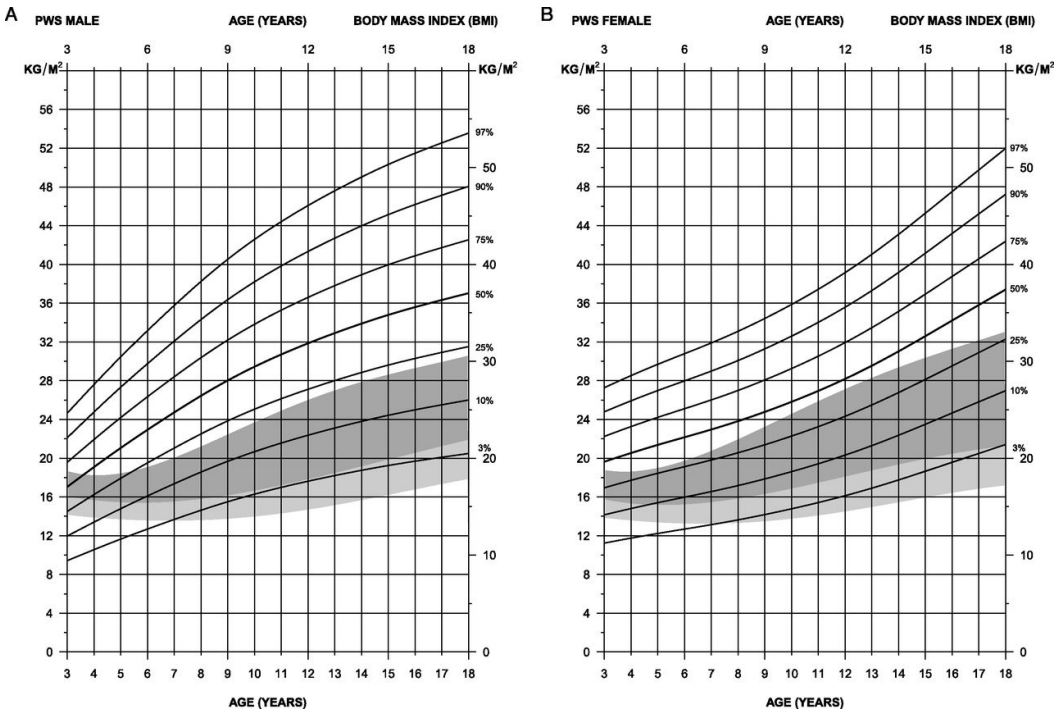

Fig.1 Centile grid of BMI for boys and girls aged 3 to 18 years [28].

In order to determine the occurrence of supermotility joints in all the patients was carried out Beighton Scale. It involves the performance of five steps, which are respectively converted into points. Score of ≥ 4 on a scale of 9 points indicates hypermobility of joints (Tab. 1) [19,20,21].

Beighton Scale	Right side	Left side
One point for each elbow that bends backwards > 10 °	1	1
One point for each thumb that touches the forearm when bent backwards	1	1
One point for each little finger that bends backwards > 90 °	1	1
One point for each knee that bends backwards > 10 °	1	1
One point if while standing forward bending you can place palms on the ground with legs straight	1	
Maximum points	9	

Tab. 1. Beighton Scale

The occurrence of hypermobility was diagnosed in 34 children (Group I) ranging in age from 6 to 11 years (13 girls and 21 boys).

The control group (Group II) included in a random fashion an equal number of boys and girls in the same age as the Group I, in which the rated value of the BMI, and there were no joints hypermobility in Beighton Scale.

Studies were performed in the gym (room temperature approx. 20°C) by the same person.

The obtained test results were statistically analyzed using the Statistica software 2010. Data were subjected to statistical verification based on t - Student test and the level of significance at $p \leq 0.05$.

RESULTS

At first introduced the values obtained during the assessment of the joints hypermobility on Beighton Scale in Group I.

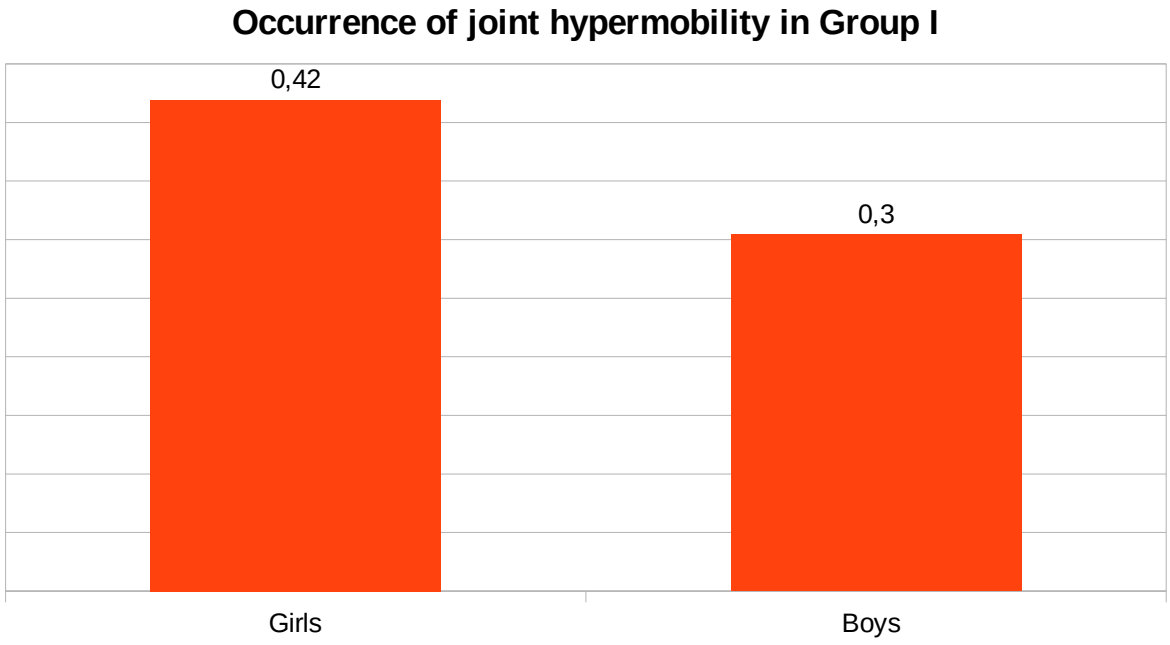

Fig. 2 Assessment of the occurrence of joint hypermobility in the Beighton scale in Group I.

In Group I the presence of hypermobility on Beighton scale was found in 41,93% girls and 30,43% boys (Fig. 2). In this group 14 children received 4 points on a Beighton Scale, 11 persons

5 points, 5 persons 6 points and one person has obtained the maximum score of 9-point. As a result of an 8-point did not receive any child.

The following is an analysis of BMI on centile charts in the Group I and the Group II.

Tab. 3 Analysis of BMI on centile charts in the Group I and the Group II.

Distribution Characteristics	BMI on centile grids		BMI	
	Healthy children (Gr. II)	**Children with hiper-mobility (Gr. I)**	**Healthy children (Gr. II)**	**Children with hipermobility (Gr. I)**
min- max	4,5 - 100	1,5 - 100	13,6 – 24,5	12,0 – 27,6
SD	27,5	29,2	2,5	3
var	755,1	853,2	6	12
me	70	65	16,9	17,7
$\overline{x}$	63	63,9	17,4	17,6
Student's t-test	0,88		-	

As shown in the table, the mean of BMI of the two groups (Group I and Group II) were close to each other and fit the standards ranges. Group I received the result $\overline{x}$= 63,9 while the Group II $\overline{x}$= 63, when the standard is in the range of from 5 to 85 percentile for the respective centile grids for age and sex of the child. Statistical evaluation of BMI on the centile charts between the Group I and Group II showed no statistical significance (p = 0,88) (Tab.3).

DISCUSSION

Data on the prevalence of joint hypermobility in children and adolescents are varied and are in the range of 7 to 65%. By Vougiouka et al. Team mild hypermobility of joints is more common in girls than in boys of school age [22]. Qvindesland and Jonsson observed occurrence of hypermobility of joints of 12-year-old patients in 40,5% of in girls and 12,9% boys [23]. Similar conclusions emerge from research Gedaliah et al. Study was done in American schools among pupils aged 5-17 years. The results confirm the increased incidence of hypermobility in girls (18%) than in boys (7%) [24]. Attention is drawn to the results of observation of Brazilian children aged 4-7, occurrence of hypermobility of joints is as many as 64,6% of them [25].

According to research their own, the presence of joint hypermobility was observed more often in girls (13 girls of 31 – 41,93%) than boys (21 boys of 69 – 30,43%). These results coincide with

the data presented by other authors. The prevalence of hypermobility in children of Greek, Icelandic, American and Brazilian, were each greater in girls than in boys [22,23,24,25].
Analyzing BMI superior to centile charts in children with supermotility arthritis and in the group of healthy children did not demonstrate a statistically significant difference ($p = 0.88$). This fact may be due to the small size of the group.

Although the test results showed no relationship between BMI values and hypermobility, both of these factors can influence the health of the child [14]. Weight control children and adolescents has a significant impact on their proper development. Additionally, it can reduce the occurrence of complications musculo-skeletal disorders in children diagnosed with hypermobility [10]. According to the report of the International Obesity Task Force trouble of maintaining a normal body weight has already one of five children in Europe [11]. The problem of eating disorders is growing very rapidly. According to data published in the report of the Institute of Mother and Child on the screening of children and adolescents, the prevention and early detection of possible dysfunction in children is very important [17]. According to research conducted with the participation of Polish pediatricians and children's endocrinologists, the most useful diagnostic method in clinical nutritional status of children is BMI calculation and comparison of this values with centile grids appropriate for the age and sex of the child. This method, however, is too rarely applied, which may delay the detection of eating disorders and lead to the deterioration of the health of the child [18]. According to a study conducted in the Department of Pediatrics, Gastroenterology and Pediatric Oncology eating disorders are most often caused by imbalance between the amount of energy supplied with food and the amount of energy expended by the body [17]. Overweight and obesity and malnutrition of all ages and regardless of etiology leads to dysfunction of multiple systems - including the musculoskeletal system. This may result from excessive weight-bearing joints in the case of overweight and obesity, or the weakening of muscle strength and ligament in the case of malnutrition. Studies have shown that in combination with co-morbidities such as, for example, hypermobility, we can expect a significant impairment of joint function [12].

Assessment of joint hypermobility among children and young people should be part of a medical examination. People with hypermobility of joints are particularly vulnerable to injuries which may occur under the influence of intensive exercise and daily physical activity [26,27].

Movements that arise within the musculoskeletal system may, over time, lead to macro-injuries and an increased risk of dislocations, subluxations and dislocations within the joints. Inadequate weight gain in children with joint hypermobility may be an additional factor that will be negatively affected locomotor system.

Due to the consequences of hypermobility, it seems expedient to show students and their parents methods of prevention and rehabilitation of disorders in case of the emergence of health risks.

CONCLUSIONS

1. Value of BMI on the centile charts are comparable in children with hypermobility and children without occurring features hypermobility of joints.
2. Given the prevalence of frequensy hypermobility among children and young people, prevention in the form of assessment of the hypermobility is very important.

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