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## **SEX- AND AGE-RELATED SPECIAL FEATURES OF SPINAL CURVATURES IN THE FRONTAL PLANE IN CHILDREN AND YOUNG PEOPLE OF THE NORTHERN REGION WITH UNDIFFERENTIATED CONNECTIVE TISSUE DYSPLASIA**

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**Key words:** undifferentiated connective tissue dysplasia, spine, children, north.

**Annotation.** The aim of the study was to assess the influence of northern factors on the development and formation of postural disorders in the frontal plane in children and adolescents in association with undifferentiated connective tissue dysplasia. A high prevalence of scoliosis was established, characterized by an increase in the number of cases from the period of the second childhood to adolescence. During the second childhood and adolescence, deformities mainly affect the thoracic section and do not have sex-related differences, while in the adolescent period, sexual dimorphism begins to appear. Undifferentiated connective tissue dysplasia complicates scoliotic deformity of the spine with the involvement of all its parts in the pathological process and a greater spread of S-shaped and Z-shaped forms.

**Introduction.** Subextremal climate conditions of the north have a negative impact on the state of health of native and alien population. Functional stress on organs and systems decreases biological tolerance of an organism of the younger generation, which has a negative effect on ontogenesis and organogenesis processes [2, 5].

In modern structure of incidence among children and youth, disorders of the musculoskeletal system are high on the list [12, 14, 15].

Data on prevalence of scoliosis in Russia are contradictory, which is 27% to 70% and higher [1, 9, 11], depending on natural and geographical area. Often scoliotic curvatures of the vertebral column are accompanied with phenotypical and visceral signs of undifferentiated connective tissue dysplasia (UCTD) [3, 7], which is a group of states forming the basis for chronic diseases with disorders of structure and functions of internal organs and systems [4, 13].

The aim of the study was to assess the influence of northern factors on the development and formation of postural disorders in the frontal plane in children and adolescents in association with undifferentiated connective tissue dysplasia.

**Methods and organization.** 308 children and young people of the Caucasian race (203 male participants and 105 female participants), born and living on the territory of the Khanty-Mansiysk Autonomous Okrug–Yugra, were examined. According to the scheme of age periodization of the postnatal ontogenesis, which was accepted on the VII All-Union Conference on Issues of age-related morphology, physiology and biochemistry of the USSR Academy of Pedagogical Sciences (Moscow, 1965) [8], participants of the study belong to the period of second childhood (105 boys and 47 girls), adolescence (37 boys and 18 girls) and young age (61 young men and 40 young women).

Selection of examination groups was conducted on the base of general education schools of Khanty-Mansiysk, children holiday camp “Yugorskaya dolina” (“Yugorsk Valley”) and the Khanty-Mansiysk State Medical Academy.

During the examination, the type of scoliosis was judged on – left-sided, right-sided, S-shaped or Z-shaped scoliosis. Left- or right-sided scoliosis was registered on one condition – if the vertebral column had a curve on the level of Th<sub>VIII</sub>-Th<sub>IX</sub> vertebrae, and if the rib hump, shoulder lift, smoothness of the waist triangle, higher location of lower angle of the shoulder blade and lift of arch of the ribs from the side of the rib prominence were present. Combined forms of vertebral column curvatures in the frontal plane (S-shaped or Z-shaped) were characterized by two primary curves on the level of Th<sub>VIII</sub>-Th<sub>IX</sub> and L<sub>I</sub>-L<sub>II</sub> vertebrae, the presence of the rib hump from the side of curvature in the thoracic section and left- and right-sided lateroflexion of the lumbar part of the spine. In case of the S-shaped scoliosis, the lumbar part had a prominence to the right, the thoracic section – a prominence to the left, in case of the Z-shaped scoliosis it is vice versa [6].

Phenotypical signs of the UCTD was evaluated according to the form developed by M.J. Glesby (1989) and Onufrijchuk Yu.O. et al. (2009) [10, 16]. Individual forms included 45 phenotype signs with registration of changes in skeleton, skin and soft tissues of the face, torso, extremities and the vision organ. The main group (MG) included 112 people (89 boys and 23 girls) with a significant amount of phenotype signs (6 to 18 stigmas). Comparison group (CG) included 112 people (114 boys and 82 girls) with 0 to 5 phenotype signs.

The Khanty-Mansiysk State Medical Academy’s Committee (protocol № 73 of 20.05.2014) approved this study. An informed consent was obtained from children’s legal representatives.

**Results and discussion.** During the study, it was revealed that the prevalence of vertebral column deformities in the frontal plane in residents of the Northern

region increases from 7 to 21 years. During the period of the second childhood, the incidence of curvatures in participants was 38,15%, during adolescence – 40%, during young age of the postnatal ontogenesis – 68,31%. The percentage ratio of scoliotic deformities of the spine in examined groups was 29,94 in participants of the MG with UCTD during the period of the second childhood – 29,54%, during adolescence – 40%, and during young age – 40%. In the participants of the CG the ratio was 41,6%, 40%, 74,13%, respectively.

The sex-based analysis of types of pathological curvatures of the vertebral column in the frontal plane showed that during the period of the second childhood the scoliotic deformity was registered in 29,26% of boys and 33% of girls with UCTD (Table 1). The prevalent type in this age-related group was the left-sided scoliosis, which was registered in 17,07% of boys and 33% of girls of the MG.

Taking into account the fact that in adolescence, the level of stigmatization in all examined girls did not reach the threshold value of 6 or more phenome signs, all of them were included in the CG, therefore, the evaluation of pathological curvatures of the vertebral column was not possible in this category. In adolescent boys of the MG, scoliosis was registered in 40% of cases and was characterized as left-sided.

Table 1

The sex- and age-based analysis of curvatures of the vertebral column in the frontal plane of residents of the Northern region aged 7-21 years with the UCTD (MG)

Age	Sex	Curvature type			
		I	II	III	IV
Second childhood (n=44)	M (n=41)	5 (12,19%)	7 (17,07%)	-	-
	F (n=3)	-	1 (33,00%)	-	-
Adolescence (n=25)	M (n=25)	-	10 (40,00%)	-	-
	F (n=0)	-	-	-	-
Young age (n=43)	M (n=23)	4 (17,39%)	3 (13,04%)	4 (17,39%)	1 (4,34%)
	F (n=20)	2 (10,00%)	5 (25,00%)	4 (20,00%)	3 (15,00%)

Note: I – right-sided; II – left-sided; III - S-shaped; IV - Z-shaped

In young age of the ontogenesis, pathological curvatures of the vertebral column in the frontal plane were characterized by greater variability and registered in 52,18% young men and 70% of young women of the MG. The most prevalent types of scoliosis in young men of the MG were the right-sided and S-shaped scoliosis, which were registered in 17% of cases. Such types as the left-sided and Z-shaped scoliosis were registered in 13,04% and 4,34% of young men of the MG,

respectively. In young women of the MG of the same age-related group, the most prevalent type of pathological curvatures was the left-sided scoliosis, which was registered in 25% of cases. It is also important to note that among those with UCTD (MG) of this age-related period, a ratio of simple and complex forms (S-shaped, Z-shaped) of scoliosis was 1,5/1 in young men and 1/1 in young women, which indicates the involvement of all parts of the vertebral column in the pathological process in half of observed cases.

The percentage ratio of types of scoliotic deformities of the vertebral column in representatives of various age- and sex-related groups of the CG is shown in table 2.

Table 2

The sex- and age-based analysis of curvatures of the vertebral column in the frontal plane of healthy residents (CG) of the Northern region aged 7-21 years

Age	Sex	Curvature type			
		I	II	III	IV
Second childhood (n=108)	M (n=64)	12 (18,75%)	16 (25,00%)	2 (3,13%)	1 (1,56%)
	F (n=44)	14 (31,81%)	-	-	-
Adolescence (n=30)	M (n=12)	-	3 (25,00%)	-	-
	F (n=18)	3 (16,66%)	4 (22,22%)	-	-
Young age (n=58)	M (n=38)	8 (21,05%)	10 (26,31%)	5 (13,15%)	2 (5,26%)
	F (n=20)	7 (35,00%)	7 (35,00%)	3 (15,00%)	4 (20,00%)

Note: I – right-sided; II – left-sided; III - S-shaped; IV - Z-shaped

According to the obtained data, during the second childhood period and adolescence, the left-sided pathological curvature of the vertebral column was the most prevalent in boys of the CG, which was registered in 25% of cases among all types of scoliotic deformity of the vertebral column. The most prevalent form of scoliosis in girls of the second childhood period was the right-sided scoliosis, whereas in the adolescent period, both right- and left-sided deformities of the thoracic section were registered almost equally. The percentage of complex forms of scoliosis in these age-related periods was about 5% of all pathological curvatures, which were registered exclusively in boys of the CG during the second childhood. In the young age, the most prevalent forms of scoliosis were the right-sided and left-sided curvatures, which were registered in 47% of young men and 70% young women respectively. Ratio of simple and complex forms of scoliosis during this developmental period in the CG was 2,5/1 in young men and 2/1 young women. It is also important to note that in both groups participating in this study there is a clear

sexual dimorphism in the detection of pathological curvatures in the frontal plane only in young age of the ontogenesis – incidence of scoliosis is 1,5 times more frequent in young women than in young men. During the second childhood and adolescence, the prevalence of scoliosis is almost equal in boys and girls.

**Conclusion.** The high prevalence of pathological curvatures of the vertebral column in the frontal plane, characterized by the increase in the incidence during maturity from the second childhood to the young age, was registered in children and youth of the Northern region.

During the second childhood and adolescence, scoliotic deformities mainly affect the thoracic section of the vertebral column and do not have sex-based differences, whereas in the young age of the ontogenesis aside from the manifestation of greater variability of pathological deformities, sexual dimorphism begins to manifest itself.

Undifferentiated connective tissue dysplasia complicates scoliotic deformity of the vertebral column with the involvement of all its parts in the pathological process and a greater spread of S-shaped and Z-shaped forms.

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