

COMPARATIVE ANALYSIS OF THE DEFORMATIONS OF THE LOCOMOTOR SYSTEM IN CHILDREN

(Preliminary communication)

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Abstract

In recent years the frequency of postural deformities in children during growth spurts has been significantly increased. The problem of the high incidence is still in force as well as the unresolved issues suggests that the problem is becoming more urgent. The aim of this study is a comparative analysis of deformations of the locomotor system through screening tests of preventive diagnostic examinations in 713 children. In recent years a significantly increased frequency of postural deformities in children during growth spurts has been viewed. The studied group of children were consist of 294 children from Blagoevgrad, 307 from Simitli and 112 children from Krupnik. The conducted study shows that the percentage of children with deviations is too high. This justifies the social significance of such studies. It must be recognized that currently existing methods of correcting and preventing postural deformities of the spine in children appear to be insufficiently effective, as this problem has reached a critical level.

Keywords: *postural disorders, curved spine, preventive diagnostic examinations, physiotherapy, scoliosis, body exercises, poor posture, girls & boys, fallen arch, flat foot, pectus excavatus, pectus carinatus*

INTRODUCTION

Postural disorders continue being one of the most difficult nosologies within the contemporary orthopedics. The research in their frequency and spread shows a continuously increased value, while the age of the affected children is constantly falling. The complexity of the problem is determined not only by the prevalence of the disease striking the child's body, but also from the subsequent dysfunctions of all organs and systems (Popova Mitova & Gramatikova, 2015). In the dynamics of today's realities, the problem of early detection and limiting the development of spinal deformities is not only medical but also socio-economic due to the relatively high frequency of adolescents with spine deformation (Stoyanova - Borisova Zlatina (Стоянова - Борисова, Златина), 2013).

The high frequencies of postural and spinal deformities today are defined not only as a medical but also as a socially significant problem common within all ages. This problem is often diagnostically neglected, both in therapeutic and prophylactic treatment, especially within the children in preschool and school age.

Spinal deformities affects unfavorable on health of children. The anatomical and physiological changes in thoracic and changing spatial arrangements of the organs in the chest cavity altering the functional activity of the heart, lungs and major blood vessels. Disturbed

breathing in the vital capacity of the lungs, reducing the mobility of the chest causes pains in the back and waist, falling confidence, physical strength and endurance. Posture is formed, as each motor habit and should be educated during the growth and development of the child (Stoyanova - Borisova Zlatina (Стоянова - Борисова, Златина), 2013).

The posture, its maintenance and education depends on the correct form of the spine, on the proper functioning of the muscles, of their strength, on the even distribution of muscle-powered, i.e. on the harmonious work of all the muscles involved in the movement of the spine (Popova, Mitova, & Gramatikova, 2015).

In a study of children from Blagoevgrad and the region aged 7 to 15 years, Stolincheva (2005) found that 34.26 % are with primary forms of spinal deformities and incorrect posture and the highest rate is in the city of Blagoevgrad - 42.63%.

The percentage of the girls 53.54 % of the total number of cases of deviations from proper posture is higher than that of the boys – 46.45 %. The values of poor posture and spinal deformities in both sexes increased when entering puberty at 12-15 years of age (Stolinchev, 2005).

Barakova (2008) makes a comparative analysis of the prevalence of spinal deformities and their course of development based on the contemporary polyclinic net-

work. The object of her study are the results of preventive and consultative examinations of 384 children and adolescents aged 6-18, conducted in 2005-2007. The author compares the data with those of her other research projects realized for over 20 years. Barakova (2008) summarizes that the results of the examinations show consistently high levels of bad posture – 16.83 % and of structural spinal curvature – 6.81 %. In her earlier study (1987-88) they were: bad posture – 15.03 %; structural spinal curvature – 5.87 %, at a massive volume research - 39 613 children. The author establishes a large percentage of poor posture and first-degree scoliosis, which according to her talks about the weak prevention and unresolved questions of general nature - a way of life in the family and school, sports activities, realization of free time and the direction of the distortion. The study indicates that right-sided scoliosis first degree were 3.56 %, left-sided – 1.58 %, right- sided scoliosis second degree – 0.44 %, on the left – 0.18 %, third degree scoliosis right – 0.063 %, on the left – 0.017 % (Barakova, 2008).

Dikov and Dikova research the frequency of the scoliosis cases with a different direction of the distortion. Within the report they found a variety of data on the incidence of scoliosis, which is explained by the different criteria study between 1% -5%. For our country a team of USBALO finds scoliosis in 1.2 percent of the surveyed students. It is considered that the frequency of the distortion was 2% greater than 10 °, 0,5% over 20 °, 2% above 30 ° and only 1% of more than 40 ° (Dikov & Dikova, 2008).

In a study of Markovska (2013) on the contingent of 1343 for the period from 2008 to 2011, were reported the following results: poor posture at 50.4 percent, with 12.1 percent of the children studied was established spinal deformities. Of the children with postural disturbances 26.5% have poor posture in the frontal plane, 10.7% in the saggital plane and 13.2% combined (saggital and frontal). Of all examined children the author registers 6.4 percent scoliosis I degree, at 0.3 percent scoliosis grade II, at 3.3% flat back and 2,1% I level distortion in a front-rear plane (Markovska, 2013).

The results of the realized maintenance diagnostic review in Blagoevgrad in 2129 children showed that the percentage of students with good posture is 372 (17.47%). The percentage of deviations from the correct posture and spinal curvature is alarming - 1757 (82.53%). Of these 898 (42.18%) were in girls and 859 (40.35%) in boys. From the data on the number of cases of deviation from the correct stand, divided by year, sex and type of postural disorder are clearly visible the following facts: in Blagoevgrad the children with good posture are only 372 (17.47%), bad posture are 1253 (58.85%) and with spinal curvature - 504 (23.67%).

From what has been said we can emphasize that the efforts of the individual authors here are mainly focused on the incidence of spinal deformities in order to attract the attention of society and state authorities to this problem. From the data can be concluded that: data on prevalence are contradictory, which may be explained by the different methods of diagnosis, which is not always mentioned. It is noteworthy, however, that in this period in Bulgaria are missing data for longitudinal studies related to monitoring the effect of individual kinesitherapeutic approaches and disclosure of basic mechanisms for generating postural problems in the spine.

The aim of this study is a comparative analysis of deformations of the locomotor system through screening tests with preventive diagnostic examinations.

METHODS

This study involved 713 children of primary school age (6-11 y.), of which 294 children from Blagoevgrad, 307 children from Simitli and 112 children from Krupnik. The study was conducted in VIII school “Arseni Kostentsev” in Blagoevgrad, at “St. Kyril and Methodi” High school in Simitli, at “St. Kyril and Methodi” High school in the village Krupnik, after signing the declarations of informed consent.

RESULTS AND DISCUSSION

The percentage of spinal deformities found in children studied from the city of Blagoevgrad is 22.45%,

Table 1. Distribution of postural disorders according to age and gender

Age	Sex	Curved spine %			Poor posture %		
		Blagoevgrad	Simitli	Krupnik	Blagoevgrad	Simitli	Krupnik
6 year	Girls	-	-	-	1,02	-	-
	Boys	0,68	-	-	0,68	-	-
7 year	Girls	3,50	-	1,79	8,16	3,58	1,79
	Boys	5,10	0,65	1,79	10,20	2,28	3,57
8 year	Girls	1,82	0,65	2,68	5,44	0,98	0,89
	Boys	1,02	0,33	1,79	7,14	3,91	0,89
9 year	Girls	1,82	1,95	0,89	6,46	2,93	0,89
	Boys	4,42	1,30	0,89	5,78	2,61	1,79
10 year	Girls	1,36	1,63	0,89	5,44	3,26	1,79
	Boys	2,73	1,30	1,79	6,80	0,65	0,89
11 year	Girls	-	1,30	3,57	-	1,30	-
	Boys	-	-	-	-	1,95	0,89
Total		22,45	9,11	16,08	57,14	23,45	13,39

Table 2. Distribution of flat foot according to age and gender

Age	Sex	Fallen arch %			Flat foot %		
		Blagoevgrad	Simitli	Krupnik	Blagoevgrad	Simitli	Krupnik
6 years	Girls	0,34	-	-	0,68	-	-
	Boys	-	-	-	0,68	-	-
7 years	Girls	3,06	2.61	-	1,36	0.98	-
	Boys	6,12	3.58	0.89	3,74	0.98	2.68
8 years	Girls	3,74	0.65	0.89	1,02	0.33	-
	Boys	2,72	1.63	3.57	3,40	1.63	0.89
9 years	Girls	2,72	2.61	-	0,68	-	-
	Boys	5,10	1.95	5.36	2,04	1.79	1.79
10 years	Girls	2,04	0.65	0.89	0,68	-	-
	Boys	4,08	0.65	1.79	0,68	0.98	0.89
11 years	Girls	-	0.98	0.89	-	-	-
	Boys	-	1.30	-	-	-	-
Total		29,93	16,61	14,28	14,63	6,69	6,25

Table 3. Distribution of deformations of chest according to age and gender

Age	Sex	Blagoevgrad		Simitli		Krupnik	
		<i>Pectus excavatus</i> %	<i>Pectus carinatus</i> %	<i>Pectus excavatus</i> %	<i>Pectus carinatus</i> %	<i>Pectus excavatus</i> %	<i>Pectus carinatus</i> %
6 years	Girls	-	-	-	-	-	-
	Boys	-	-	-	-	-	-
7 years	Girls	1,36	-	-	-	-	-
	Boys	1,70	0,34	0,65	-	-	-
8 years	Girls	-	-	-	-	-	-
	Boys	1,02	0,68	0,65	0,65	0,89	0,89
9 years	Girls	-	-	-	-	-	-
	Boys	0,68	0,34	0,65	0,98	0,89	-
10 years	Girls	-	-	-	0,33	-	0,89
	Boys	1,02	0,68	0,98	0,65	-	-
11 years	Girls	-	-	-	-	-	-
	Boys	-	-	0,65	-	0,89	-
Total	Total	5,78	2,04	3,58	2,61	2,68	1,79

Table 4. Results from the disruptions of the locomotor system in children of age from 6 to 11 years old

Deformation	Blagoevgrad	Simitli	Krupnik
Spinal deformities	22,45	9,11	16,08
Improper posture	57,14	23,45	13,39
Fallen arch	29,93	16,61	14,28
Flatfoot	14,63	6,69	6,25
Pectus excavatus	5,78	2,04	3,58
Pectus carinatus	2,61	2,68	1,79

with 57.14% - deviations from the correct posture. Of these girls with poor posture 26.53% and boys 30.61 percent. At 8.50% of the girls were found spinal defor-

mities and within boys 13.95%.

The percentage of children with good posture of Simitli is 67.44%. The percentage of deviations from

the correct posture is 32.56%. Of these, 23.45% - poor posture and spinal curvature at 9.11%. Followed findings poor posture are: Girls - 12.05% and boys - 11.4%. At 5.53% of the girls were found spinal curvature and boys 3.58%.

The percentage of deviations from the correct posture to the village of Krupnik is - 29.47 percent, 13.39 percent of them - poor posture, spinal curvature - 16.08%, and with good posture are 70.53%. Followed findings poor posture is: girls - and boys 5.36% - 8.03%. At 9.82% of the girls were found spinal curvature and boys 6.26%.

The arch of the foot participates in the motor system as a whole and influences the all of its units. Flat foot is a deformation of the muscles of the foot, expressed in a fall in the cross and / or longitudinal arch of the foot. In the presence of flatfoot the center of gravity is changed and the statics of all units' cranial chain of the human body - calves, thighs, hips, spine (Popova, Mitova, & Gramatikova, 2015).

After processing of the plantography data from 294 children from the town of Blagoevgrad, we found normal foot in 163 children (55.44%). The remaining 131 (44.56%) children had an abnormal one. With fallen arch (index Chizhin between 1 and 2) were 29.93% of the children. With deformities (at Chizhin index of greater than 2) were recorded 14.63 percent of surveyed children.

Of the children studied in Simitli n = 307 diagnosed with fallen arch are: girls - and boys 7.5% - 9.11%. At 1.31% of the girls was found flatfoot and boys 5.38%.

Of the children studied in the village of Krupnik n = 112, ascertained fallen arch are: girls - and boys 2.67% - 11.61%. At 0% of girls was found flatfoot and boys 6.25%. Prevalence of deformities according to age and gender is presented in Table 2.

Of deformation of the chest with the highest percentage are the children with Pectus excavatus (shoemaker chest) - 5.78% for Blagoevgrad, 3.58% of Simitli, Krupnik - 2.68%. With rectus carinatus (bird's chest) in Blagoevgrad were found - 2.04% to Simitli - 2.61% for the village of Krupnik - 1.79%. Distribution of deformations of chest according to age and gender is shown in Table 3.

On Table 4. are presented the results from the disruptions of the locomotor system in children of age from 6 to 11 years old. The highest percentage with children with posture disorders – 57, 14 % in Blagoevgrad; 23, 45 % - Simitli and 13, 39 – Krupnik. With a fallen arch are 29, 92 from the children in Blagoevgrad, 16, 61 from the children in Simitli. The least deformations are found while examining the chest. With a “shoemaker chest” from Blagoevgrad are 5, 78 % of the children, 2, 04 of the children in Simitli and 3, 58% of the children in Krupnik.

CONCLUSION

The conducted study shows that the percentage of

children with found deviations is too high.

Along with their proven effectiveness methods for recovery of children with deformations of the locomotor system, increases the need for health promotion and deformities prevention and practicing of modern approaches to development and introduction of kinesitherapy in preschool and school age. The comparative analysis of the prevalence of postural deformities and spinal deformities among adolescents made, confirms the social significance of the problem.

The exact evaluation of the pathokinesiological deviations in postural deformities and spinal deformities requires the application of modern methods of research. To have maximum good therapeutic effect, the kinesitherapeutic program should be conducted daily. School age is extremely favorable for the implementation of preventive therapeutic measures.

Unfortunately, the spinal deformities often develops progressive. This leads to severe malformations of the spine that infringes the function of internal organs, having in perspective a limited choice of profession and difficulties in social interaction, leading to dissatisfaction with life. In contemporary conditions the problem is even deeper due to reduced physical activity of children, unhealthy diet and obesity, congenital anomalies of the spine which could lead to increasement of the number of traumatic injuries.

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