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RESULTS AND ANALYSIS OF A STUDY ON THE DEFORMATIONS OF THE MUSCULOSKELETAL SYSTEM IN CHILDREN OF PRIMARY SCHOOL AGE

(Original scientific paper)

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Abstract

Screening for early diagnosis changes and deformations of the musculoskeletal system in adolescents has been made within this study. The problem is not new, but with many reports of physical development of adolescents increasingly raises the question of greater frequency and severity of these deviations. The aim of this study is to make a comparative analysis of the deformations of the musculoskeletal system in children of 7-11 years. This study involved 307 children from the town of Simitli aged (7-11 yr.) and 112 children from the village of Krupnik (aged 7-11 yr.). The percentage of deviations from the correct posture is 62.03%. Of all diagnosed cases, the highest percentage of poor posture - 36.84%, are with spinal deformities - 25.19%. With a broken arch are 30.89% of the surveyed children and with deformities are 12.94%. By deformation of the chest with the highest percentage are children with Pectus excavatus (shoemaker chest) - 6.26%, Pectus carinatus (bird chest) - 4.4%.

Keywords: *postural disorders, spinal deformities, children, musculoskeletal system, correlation*

INTRODUCTION

Postural disorders represents changes in motor habit during standing still. Initially, changes in the normal posture have a functional character, but in the absence of proper correction lead to permanent structural changes, primarily in the spine (Popov (Попов), 2006). The modern lifestyle, the latest technical innovations and a number of other causes decreased the locomotor activity of the population, especially within the children. In the recent years there has been a significant increase in extreme deviations from the correct posture and spinal deformities in children during the growth stresses. The standing body posture is made and formed parallel to the child's growth and development of all body functions, especially the proper functioning of the musculoskeletal system.

The standing body posture is formed under the influence of the external environment and is formed as any other motor habit and should be brought up during the growth and child's development as all other motor skills are made. Motor stereotype of proper body posture must be maintained, since it can change both in positive and in negative sense. Stand and the body posture, their maintenance and education depends on the correct form of the spine, on the proper functioning of the muscles, their strength, distribution of the muscle-power, ie the harmonious work of all the muscles involved in the movement of the spine.

The seriousness of the problems of impaired posture in children and adolescents due to the fact that lack of timely correction of the static deformation, which is a predisposing factor for the development of structural changes in the spine and diseases of internal organs, which are the cause of disabilities in the middle age (Abolishin & Cickishvili (Аболишин & Цицкишвили), 2006). The arch participates in dynamics of the musculoskeletal system as a whole and has an impact on all its units. This is due to the fact that the presence of deformities expressed disrupting of the normal static body while standing, leading to uneven loading on the spine. Deformities represents strain of the muscles of the foot, expressed fall in the transverse and / or longitudinal arch of the foot. In the presence of a flatfoot, the center of gravity changes the statics of all units of the cranial chain of the human body - calves, thighs, hips, spine. Together with the altered gait and lack of the damping function of the foot, contributes to the excessive overload on the knees, hips and spine. As a result, these structures suffers from joint and muscle tension, which leads to dull pain when walking (Mitova, Popova & Gramatikova, 2015). The problem of the high incidence of postural deformities remains today and the outstanding issues indicate that it is still relevant.

METHODS

The aim of this study is to make a comparative analysis of the deformations of the musculoskeletal system in children of 7-11 years. A screening for early diagnosis changes and deformations of the musculoskeletal system in children from 7- 11 years of Simitli and the village of Krupnik was realized. This study involved 307 children from the town of Simitli aged (7-11 yr.) and 112 children from the village of Krupnik, after signing the written consent. To establish the existence of postural distortions we applied the following methods: (history; somatoscopy (visual); palpation, functional tests - screening of the level of postural disorder; plantography - determining the extent of the changes in the feet).

This study involved a total of n = 419 children aged 7 to 11 years. From the town of Simitli were examined n = 307 children of which n = 151 girls and n = 156 boys. From the village of Krupnik n = 112 children of which n = 53 girls and n = 59 boys. The number of children studied was different, depending on the number of children in the school, and depending on how many of the respondents have given the written consent to participate in.

RESULTS AND DISCUSSION

Results of the preventive and diagnostic examination in Simitli covered n = 307 children with a mean (± SD) values of height and weight - 140 ± 11 sm. and 41 ± 31kg, and Krupnik n = 112 children with a mean (± SD) values of height and weight - 130 ± 8.7 sm. and 35 ± 12kg. The percentage of children with good body posture of Simitli is 67.44%. The percentage of deviations from the correct body posture is 32.56%. Of these, 23.45% - poor body posture and spinal curvature at 9.11%. The percentage of deviations from the correct body posture for Krupnik is - 29.47 percent, 13.39 percent of them - poor body posture, spinal curvature - 16.08%, and with good body posture are 70.53%. The prevalence of postural disorders by age and sex is presented in Table 1.

Of the children studied in the town of Simitli, n = 307 found with poor body posture are: girls - 12.05% and boys - 11.4%. At 5.53% of the girls were found spinal curvature and 3.58% for boys. Of the children studied in the village of Krupnik n = 112, recorded poor postures are: girls - and boys 5.36% - 8.03%. At 9.82% of the girls were found spinal curvature and 6.26% for boys.

Table 1. Prevalence of postural disorders by age and sex of the children studied

Ages	Sex	Spinal deformities %		Improper posture %	
		Simitli	Krupnik	Simitli	Krupnik
7 age	F	-	1.79	3.58	1.79
	M	0.65	1.79	2.28	3.57
8 age	F	0.65	2.68	0.98	0.89
	M	0.33	1.79	3.91	0.89
9 age	F	1.95	0.89	2.93	0.89
	M	1.30	0.89	2.61	1.79
10 age	F	1.63	0.89	3.26	1.79
	M	1.30	1.79	0.65	0.89
11 age	F	1.30	3.57	1.30	-
	M	-	-	1.95	0.89
Total %		9.11	16.08	23.45	13.39

Table 2. Distribution of deformities according to age and sex

Ages	Sex	Fallen vault %		Flat foot %		Total %
		Simitli	Krupnik	Simitli	Krupnik	
6 age	F	2.61	-	0.98	-	3.59
	M	3.58	0.89	0.98	2.68	8.13
7 age	F	0.65	0.89	0.33	-	1.87
	M	1.63	3.57	1.63	0.89	7.72
8 age	F	2.61	-	-	-	2.61
	M	1.95	5.36	1.79	1.79	10.89
9 age	F	0.65	0.89	-	-	1.54
	M	0.65	1.79	0.98	0.89	4.31
11 age	F	0.98	0.89	-	-	1.87
	M	1.30	-	-	-	1.30
Total %		16.61	14.28	6.69	6.25	43.83

Table 3. Distribution of strained chest by age and sex

Age	Sex	Simitli		Krupnik	
		Pectus excavatus	Pectus carinatus	Pectus excavatus	Pectus carinatus
7 age	F	-	-	-	-
	M	0.65	-	-	-
8 age	F	-	-	-	-
	M	0.65	0.65	0.89	0.89
9 age	F	-	-	-	-
	M	0.65	0.98	0.89	-
10 age	F	-	0.33	-	0.89
	M	0.98	0.65	-	-
11 age	F	-	-	-	-
	M	0.65	-	0.89	-
Total		3.58	2.61	2.68	1.79

Of the children studied in the town of Simitli n = 307 diagnosed with fallen vault are: girls - boys and 7.5% - 9.11%. At 1.31% of the girls was found a flatfoot, and 5.38% for boys. Of the children studied in the village of Krupnik n = 112, diagnosed a fallen vault are: girls - and boys 2.67% - 11.61%. At 0% of girls was found a flatfoot, and 6.25% for boys. Proliferation of deformities according to the age and sex is presented in Table 2.

By deformation of the chest with the highest percentage are children with Pectus excavatus (shoemaker chest) total - 6.26% of them - 3.58% of Simitli in the village of Krupnik - 2.68%. With rectus carinatus (bird chest) are generally 4.4% to Simitli - 2.61% for the village of Krupnik - 1.79%. Distribution of the chest deformations according to age and sex is presented in Table 3.

Correlation analysis between the spine curvatures and deformities in the respondents: Correlation analysis was performed on a sample of 20 persons. Were studied 307 children from the town of Simitli aged (7-11 yr.). A modest correlation between the spinal deformities and the flat feet (Figure №1.) during the studied children from the town of Simitli with a correlation coefficient of Spearman r = -0,39 and 95% confidence interval (0.7146 t).

Correlation analysis was performed on a sample of 20 persons. Studied 112 children from the village of Krupnik (aged 7-11 yr.). Found a significant correlation between the spinal deformities and flat feet (Figure 2.) in the studied children from the village of Krupnik with a correlation coefficient of Spearman r = -0,55 and 95% and confidence interval (-0.8017 to -0.1236).

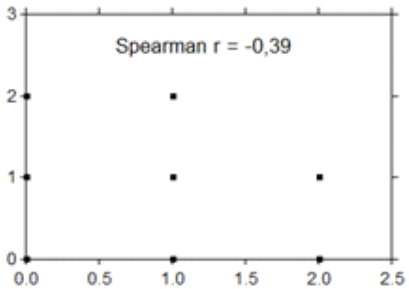

Figure 1. Correlation between spine curvatures and deformities in respondents from Simitli

To test differences between the spinal deformities (Figure 3.), and the differences between deformities (Figure №4.), respondents from Simitli and

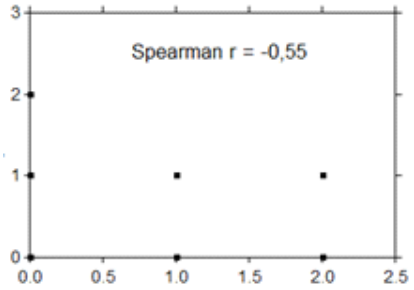

Figure 2: Correlation between spine curvatures and deformities in respondents of Krupnik

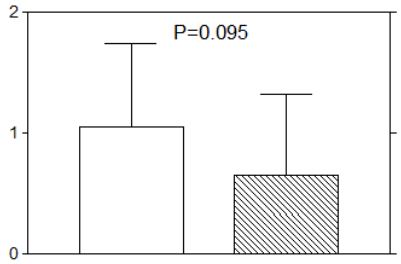

Figure 3. Evaluation of the differences in spinal curvature of respondents from Simitli and Krupnik with Mann Whitney test; no statistically significant difference (P = 0.095)

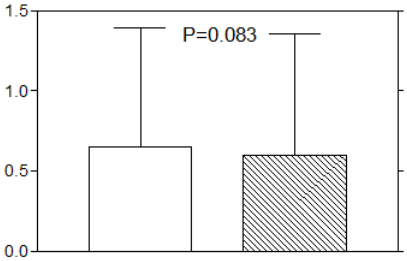

Figure 4. Evaluation of differences in deformities of respondents from Simitli and Krupnik with Mann Whitney test; no statistically significant difference (P = 0.083)

Krupnik compared with their average non-parametric test of Mann-Whitney for comparing the average for small independent samples (20 persons). No statistically significant difference. Statistically significant differences were found at $P < 0.05$.

CONCLUSION

Of all diagnosed cases, the highest percentage of deviations from proper posture was - 62.03%. Of all diagnosed cases, the highest percentage of poor posture - 36.84%, with spinal deformities - 25.19%. These data are similar to those of Wong, Hui, Rajan & Chia (2005). The percentage of children with good body posture of Simitli is 67.44%. The percentage of deviations from the correct body posture is 32.56%. Of these, 23.45% - poor posture and spinal curvature at 9.11%. The percentage of deviations from the correct body posture for Krupnik - 29.47 percent, 13.39 percent of them - poor body posture, spinal curvature - 16.08%, and with good body posture are 70.53%. With a broken arch are 30.89% of the surveyed children with deformities and are 12.94%.

Of the children studied in Simitli with a broken arch are: girls - boys and 7.5% - 9.11%. At 1.31% of the girls was found flatfoot, and 5.38% for boys. Of the children studied in the village of Krupnik dropped vault with 2.67% are boys and girls - 11.61%. At 0% of girls - flatfoot, and 6.25% for boys. By deformation of the chest with the highest percentage are children with Pectus excavatus (shoemaker chest) total - 6.26% of them - 3.58% of Simitli in the village of Krupnik - 2.68%. With rectus carinatus (bird chest) are generally 4.4% to Simitli - 2.61% for the village of Krupnik - 1.79%.

In recent years it is significantly increased the frequency of spinal deformities in children during growth spurts. The body posture and the gait, facial expressions, gestures have highlighted the individuality and an essential feature of personality. Holding the correct position ensures stability of the body and is important for the daily mobility activities. Furthermore, it is most favorable to the functioning of internal organs, at least encumber the musculoskeletal system and requires less effort. All this explains why the interest in postural disorders dates back to ancient times and has not declined even today. Early diagnosis of postural disorders and spinal deformities, can be achieved through an efficient screening system. In the fight against the spinal deformities and their early diagnosis, every parent, teacher and health worker must have the necessary knowledge. It is an obligation of the health network through appropriate forms and means to increase the health awareness on this issue. The best treatment of postural disorders and spinal deformities is prevention. To teach the children to play sports moderately from the early childhood and to avoid the bad habits which leads to deformities of the spine.

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