The Frequency of Deformities of Kyphosis and Flat Feet in Preschool Children of Raska Region in respect to their Place of Residence

Admira Koničanin[a], Danilo Aćimović[b], Omer Špirtović[c], Kimeta Hamidović[d]

[a] Faculty of Sport and Physical Education, State University of Novi Pazar, Vuk Karadzic bb, Rector's Office: 020 317 752

[b]Department of Bio-chemical and medical science, State University of Novi Pazar, Vuk Karadzic bb, Rector's Office: 020 317 752

[c]Department of Bio-chemical and medical science, State University of Novi Pazar, Vuk Karadzic bb, Rector's Office: 020 317 752

[d]Department of Philology, State University of Novi Pazar
Corresponding author: Kimeta Hamidović

Abstract

The study aims to investigate the frequency of kyphosis and flat feet in preschool children in respect to their place of residence. Research sample consists of 229 examinees, of which 114 are girls and 115 are boys. The research programme has encompassed the examinees aged form 6 ± to 7 ±, that is, preschool children of the region of Raška. Flat feet are determined by plantography, analysis of plantogram is conducted by the use of the Thompson's technique, and the value of Chi-Square test at the level of significance p=0.5. For the kyphosis assessment, somatoscopy and somatometry are used. According to the value of Pearson Chi-Square it can be concuded that there is a statistically significant difference in frequency of flat feet regarding the sample's place of residence. According to the value of Pearson Chi-Square it can be concuded that there is no statistically significant difference in frequency of kyphosis between the genders. According to the value of Pearson Chi-Square it can be concuded that there is no statistically significant difference in frequency of kyphosis in respect to the sample's place of residence. Theoretical value of the research is the generalization of the obtained results that body deformities of kyphosis and flat feet are frequent in preschool children, that there is no statistically significant frequency of the deformities regarding geosociological factors of their pace of residence. By determining the frequency of postural deformities of flat feet and kyphosis between the genders and regarding their place of residence, the results obtained can be used as an encouragement to the educators in preschool facilities.

KEYWORDS: preschool children, kyphosis, flat feet

Introduction

The preschool period is a developmental period of children when the basis of human development, together with the basis of further education and bringing up, are acquired and certified. Urban conditions, enviroment and children's modern lifestyle have a negative influence on a child's development, especially on postural defect of flat feet. The prevention of body deformities has been a common issue for years. It is surprising that, despite the fact that issues of postural defects and body deformities especially in preschool childern have been known for years, the clear cause that

contributes the deformities and brings consequences on children's health has not been found yet. Status of children and school youth has become a current issue considering their lifestyle. Thus there has been a need for studying the postural defects and body deformities in preschool and school childern, especially because this period is a transition to the period of second somatic transformation, which largely influences body posture. Under the influence of modern lifestyle children are not active; thus there is no balanced development of skeletal and muscular systems. Postural status of preschool and school children has been investigated by a number of scholars and their results differ to some degree, yet are similar as well. On the basis of the available theoretical, scientific, research and professional papers, it can be assumed that research of postural defects in preschool childern are of relatively recent origin.

Not only does the inate need for movement represent satisfaction and leisure for a child, it also represents the value of balance against atrophy of muscles and ligaments, against the evolution of malformations and body deformities.[1]

The researcher Đorđić states that physical activity of the youngest population is not satisfactory when it comes to its frequency, nor its intensity. The situation is the most difficult in urban environments. The same author highlights that physical activity in preschool children is important a) from the point of integral development b) from the biological and health point ,c) and from the point of upbringing .[2]

The time children spend in playing sports games is decreasing while the time spent passively, sitting or lying, is increasing.[3]

Decreased physical activity is the reason that contributes the frequency of poor body posture in children. Physical inactivity results in muscular hipotrophy, decreased muscular tonus where incorrect body posture during walking or sitting becomes an easy target for postural deformities.[4]

Sport and other forms of exercise have been proven to have preventive influence on health, thus it is essencial that children are encouraged to practice sport or any other form of physical activity in order to enhance motoric abilities in general, which plays a vital role in moving certain organs, as well as the entire body.

Movement and physical activity is crucial in development and maintenanace of appropriate bone density (Twomey, 1992). Programs of physical activity involving strength exercises and strengthening of muscles, especially of postural antigravity muscles, should be helpful in preventing health issues that could appear later in life .[5]

Džinović Kojić (2000) states that one of the basic aims of physical upbringing is the influence it can have on general development of human system. Motoric activities and exercises encourage growth and development and prevent the consequences of being physically passive which is common in children. By the means of physical exercises correct body posture is formed, hygienic habits are established and the formation of comprehensive motoric abilities is influenced upon. [6]

As defined by various authors, incorrect body posture includes a variety of deviations from the correct one.

Muscles, as an active part of movement system, have the most important role in the formation and maintenance of correct body posture. The weakness of certain muscle groups, that are overloaded, can cause various deformities of spinal cord, chest, upper and lower limbs, especially of feet. Formation of correct postural status is significant in preschool and early school period because of plasticity and sensitivity of a child’s organism.[7]

Correct body posture represents the balance between muscular and skeletal systems which protects supporting body structure from injuries or progressive deformities irrespective of body position (standing, sitting, kneeling, or lying) in which these structures are active or passive. Under these conditions, muscles will have the most efficient function, while optimal position will enable chest and abdomen organs to work properly. [8]

Correct body posture involves regular relations among all segments of a body. Movement system, especially muscles as its active and skeleton as its passive part, plays the most significant role in formation and maintenance of correct posture. [9]

Correct body posture formation, apart from a range of other factors, is dependent mostly on the engagement of parents, educators, teachers and professors. [10]

The weakness of certain muscle groups, that are overloaded, causes the defects of correct posture thus bringing various changes concerning deviation of segments of system for walking from correct posture. Those deviations are frequent in the developmental period (children and adolescent period). According to Mc Evoy and Grimmer (2005), postural control develops segmentally in cefalocaudal direction. [11]

Body postrure involves correct settlement of the body segments and their balance achieved by minimal strength together with maximum of mechanical efficiency. [12]

Huge number of hours spent on lectures, short breaks, non-functional and unadjusted furniture, improper light in the room increase the intensity of negative factors that affecst the developing organism. [13]

Complex functional transformation of a person in development is not performed regularly and equally in different parts of an organism, but in accordance with rythmic flow, which is marked by the so-called developmental crises. [14]

Early diagnosis is the most important element of succesful treatment, together with persistent work on the part of teachers, doctors, the children in question, as well as their parents. Incorrect body posture, which are the consequence of the decreased structure of postural muscles, which are revealed in the early period of life, can be corrected by additional kinesiotherapy programs and sport activity. It is essential to identify postural defect in preschool period because it is a necessity to form „a pattern of good body posture“ which, „if acquired during early chilhood, not only contributes correct development of children, but also has positive influence on their health and life quaity in the later years“ [15] The term *posture* includes position, pose, or body posture (Đorđić, 2007) and represents descriptive term for the relative position of body segments during inactivity or activity. (Demeši-Drljan & Mikov, 2012). Thus *posture* encompasses biomechanical parameters of the body that define its posture, thus paying attention to the relations of all body segments. Correct postural status of the body is influenced by proper functioning of the active part of locomotor system. [16,17]

Kyphosis is a deviation of spinal cord in sacral (antero-posterior) region, in its thoracic region, with convex curvature backwards.[18]

According to their origin, there are various types of kyphosis. Postural or juvenile kyphosis can be found in developing children as a result of insufficiency of muscle groups during their rapid growth.

Živković and Milenković (1994) have studied postural defects in children in all of the kindergardens in the region of Niš. Results have shown that there are early

deformities of spinal cord in 52%, of chest in 24%, of feet in 61%, as well as that 61% of children is obese while 9% of them is malnutritioned. [19]

Pecina (1992) considers that incorrect body posture, including scoliotic, kyphotic and lordotic posture, is an anomaly of body posture which is flexible (loose) and which can be corrected by the change of body position or willful muscle contraction. [20]

Kyphotic posture is more frequent in male pupils, while lordotic posture is more frequent in female pupils. A large number of perceived kyphotic posture is a result of sudden and rapid skeletal development, decrease in spinal sustainability, lack of body hygiene, improper physical activity, as well as preventive and corrective modes of exercises. [21] According to the latest studies and statistical data, deformities on body posture in children are mostly influenced by weakness of back, chest or abdomen muscle regions. Moreover, weakening of pelvis region and lower limbs can result in secondary deformities of upper parts of a body. [22]

Pes planus or flat foot is a condition in which the longitudinal arch of the foot is lowered or flattened out. There are three levels of flat feet. Frequency of this kind of deformity is encountered in 40-75% of cases, and it mostly involves insufficient foot. [1]

By definition, flat foot is easily identifiable clinical deformity determined by malposition of several parts of the foot. The formation of the foot arches begins with the first steps of a child and its full formation should be completed by the age of three. There are no clear boundaries to the completion of arches and deformities' formation. [23] The foot (*ples*) is the main pillar of support to the locomotor system and plays a functional role in the realization of all forms of walking on two legs. The foot also represents one of the most comlicated anatomic segments of human body, thus representing a critical point in body posture. It consists of elements that should enable two impotrant functions: standing – static function and walking – dinamic function. In other words, the foot has to be statically strong enough to carry the body's weight, at the same time dinamically adjusting to the ground to enable standing, walking, running and punch amortization**.** [24,25,26,27,28]**.**

Among other factors, the formation of deformities is infuenced by hereditary factors, constitution, muscles and ligaments' weakness. Children who started walking earlier, physically inactive ones, as well as the obese children are under higher risk for having foot deformities. [29] The studies have shown that the longitudinal arch of the foot develops during the first ten years and during that period the arch is going upwards. [30] Lowered arch of the foot does not jeopardize health directly, but it certainly has an influence on the quality of everyday life.

Methods

Research sample

The research has been conducted in the preschool facilities in the region of Raška, during the years of 2008 and 2009. The research programme has encompassed the examinees aged form 6 ± to 7 ±, that is, preschool children. The sample consists of 229 pupils, of which 114 are girls and 115 are boys. The research sample can be considered to be representative regarding its number and the way of choosing it.

Variables

When the choice of variable is concerned, the variables which satisfiy basic metric characteristics (validity, reliability, objectivity, sensitivity and the like) are used, which are also suitable for the examinees' age according to the insctructions of International Biological Programme – IBP. Moreover, the variables that are supposed to explore the deformity in question in detail are used in the research. Defomity of flat foot (ples planus) is used for the assessment of deformity of lower limbs, as well as the variable flat foot ([1]PDFFT). Flat feet are determined by plantography, and assessement of foot posture is calculated using Thompson's technique. Furthermore, somatoscopy and somatometry are used for assessing the variable kyphosis ([2]PDKYPH). The obtained results are shown statistically in the form of tables, as well as the value of Chi-Square test at the level of significance p=0.5. Variables that have been used for assessing the deformity of flat feet are in the domain of corrective gymnastics.

Results and discussion

The obtained results on deformities of flat feet are statistically calculated and given in the form of percentages. Given that postural status of flat feet and kyphosis is more of qualitative than quantitative nature, relevant frequency of postural deformities flat feet and kyphosis and the percetage of their deviation from normal posture are calculated by means of statistical analysis. During the analysis Chi-Square at the level of significance p=0.5 is used as well. Data obtained by antropometric measurments of height and weight are examined by t-test for independent groups.

Analysis of research sample's categorical variables of postural defects

Descriptive statistical Crosstabs analysis and Chi-square test of postural defects in children with regard to gender

This chapter provides an analysis of the obtained data on descriptive statistical indicators on the basis of Crosstabs analysis, as well as statistical significance of frequency of the deformity between two genders determined by Chi-square test. Significant value of statistical significance is explored at the level of $p< 0.01$.

Table 1 provides results of Crosstabs analysis on distribution of postural deformity of flat foot in the research sample, influenced by gender difference. Regarding the male population, 24 or 20,9 % of the boys out of 115 total has first degree deformity of flat foot, while 12 boys or 10,4% have second degree deformity. Out of total of 114 girls examined, 9 girls (7,9 %) have first degree postural deformity of flat foot, while10 girls (8,8 %) have second degree deformity of flat foot. Average frequency of first degree postural deformity, out of total number of examinees, is 14,4 %, or in 33 children, while average frequency of second degree postural deformity is 9,6 %, or 22 children of total population.

Table 2 shows the results of Chi-Square Tests, and according to the size of Pearson Chi-Square 8,467a and Asymp. Sig. (2-sided) ,015 it can be concuded that there is a statistically significant difference in frequency of the deformity between genders, as well as that the deformity is more frequent in boys.

[1] PDFF stands for POSTURAL DEFORMITY FLAT FEET
[2] PDKYPH stands for POSTURAL DEFORMITRY KYPHOSIS

Table 3 depicts the results of Crosstabs analysis of postural deformity distribution of lumbal kyphosis of the research sample, influenced by gender differences. When it comes to male population, out of 115 boys, 5 boys or 4,3 % of the total sample has this deformity. When it comes to female population, 3 girls or 2,6 % of the total sample has this postural deformity. Average frequency of the postural deformity of lumbal kyphosis, regarding the total sample of examinees, is 8 children or 3,5 % of the children.

Table 4 indicates the results of Chi-Square Tests, and since the value of Pearson Chi-Square, 500a and Asymp. Sig. (2-sided),479 it can be concluded that there is no statistically significant difference in the frequency of this deformity between the genders.

Descriptive statistical Crosstabs analysis and Chi-square test of postural deformities in children in respect to the place of research (town)

This chapter provides an analysis of the obtained data on descriptive statistical indicators on the basis of Crosstabs analysis as well as statistical significance of frequency of the deformity in respect to the place of residence (town) determined by Chi-square test. Significant value of statistical significance is explored at the level of $p< 0.01$.

Table 5 depicts results of Crosstabs analysis on distribution of postural deformity of flat foot of the sample, in respect to place of residence (town).

Overall, total population of examinees in the four towns is 229 (boys and girls), and the postural deformity of flat feet of first degree is determined in 33 children or 14,4 % of total research sample, while deformity of flat feet of second degree is determined in 22 children or 9,6 % of total research sample.

Table 6 reveals Chi-Square Tests, where according to the value of Pearson Chi-Square 35,129a and Asymp. Sig. (2-sided) ,000 it can be concluded that there is a statistically significant difference in the frequency of deformity of flat feet regarding the sample's place of residence (town).

Table 7 depicts the results of Crosstabs analysis on distribution of postural deformity of lumbal kyphosis in the research sample regarding their place of residence (town).

Overall, this postural deformity is determined in 8 children or 3,5 % of total sample of 229 examinees (boys and girls) in the four towns.

Table 8 shows Chi-Square Tests, and according to the size of Pearson Chi-Square ,221a and Asymp. Sig. (2-sided) ,974 it can be concluded that there is no statistically significant difference in frequency of lumbal kyphosis in respect to the sample's place of residence (town).

Conclusion

Main aim of the research was to establish differences in postural deformities in preschool children in Raška region which is comprised of four towns: Tutin, Sjenica, Novi Pazar and Raška. The research has been conducted among 229 preschool

children, of which 115 are boys and 114 are girls, aged from 6 to 7 years ± six months.

The obtained results are statistically analyzed, shown in the tables and interpreted. According to the results of analysis of categorical variables of postural deformities of the research sample, descriptive statistical Crosstabs analysis and Chi-square test of postural defomities in children regarding their gender and place of residence, it can be concluded that flat feet are not present in large amount in preschool children of Raska region (in the four cities). According to the size of Pearson Chi-Square 8,467a and Asymp. Sig. (2-sided) ,015 it can be concluded that there is a statistically significant difference in the frequency of flat feet and that it is more frequent in boys. According to the size of Pearson Chi-Square 35,129a and Asymp. Sig. (2-sided) ,000 it can be concluded that there is a statistically significant difference in the frequency of deformity of flat feet regarding the sample's place of residence (town).

The following results are obtained according to the Crosstabs analysis on distribution of postural deformity of kyphosis, influenced by gender. The average frequency of kyphosis out of total sample number is 3,5 % or 8 children. According to the value of Pearson Chi-Square, 500a and Asymp. Sig. (2-sided),479 it can be concluded that there is no statistically significant difference in the frequency of kyphosis between the genders.

According to the value of Pearson Chi-Square ,221a and Asymp. Sig. (2-sided) ,974 it can be concluded that there is not a statistically significant difference in frequency of kyphosis in respect to the sample's place of residence (town).

Overall, it can be concuded that postural deformities of flat feet and kyphosis are equally present when it comes to the sample of the same chronological age, as well as that, generally speaking, there is no statistically significant difference in distribution of postural deformities in respect to place of residence.

Possibility of research generalization

Teoretical value of the research is the generalization of the obtained results indicating that there is no statistically significant difference regarding the deformities in respect to geosociological factors of the place of residence. The results have also shown that the frequency of postural deformities in respect to gender is minimal, which can be interpreted by taking chronological phase of research sample into account. Generally and theoretically speaking, considering the results of postural defects of flat feet, this research may open the issue about physical activity of children in preschool facilities with the aim of establishing proper development of children of this age group. By determining the frequency of postural deformities of flat feet and kyphosis between the genders and regarding their place of residence, the results obtained can be used as an encouragement to the educators in preschool facilities, school teachers and parents to be more dedicated to the children by establishing better conditions through fostering correctional gymnastics in preschool activities.

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Table 1

Flat feet- PDFF

			PDFF			Total
			0	1	2	
Gender	1	Boys	79	24	12	115
		% within gender	68,7%	20,9%	10,4%	100,0%
	2	Girls	95	9	10	114
		% within gender	83,3%	7,9%	8,8%	100,0%
Total		Count	174	33	22	229
		% within gender	76,0%	14,4%	9,6%	100,0%

Table 2

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8,467[a]	2	,015

a. 0 cells (,0%) have expected count less than 5. The minimum expected count is 10,95.

Table 3

Kyphosis - PDKYPH

			PDKYPH		Total
			0	1	
Gender	1	Boys	110	5	115
		% within G	95,7%	4,3%	100,0%
	2	Girls	111	3	114
		% within G	97,4%	2,6%	100,0%
Total		Count	221	8	229
		% within G	96,5%	3,5%	100,0%

Table 4 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	,500[a]	1	,479

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 3,98.

Table 5

Flat feet- PDFF

			PDFF			
			0	1	2	Total
Town	1	Sjenica	21	9	0	30
		% within	0,0%	30,0%	,0%	0,0%
	2	Novi Pazar	52	17	0	69
		% within	5,4%	24,6%	,0%	0,0%
	3	Raška	25	2	4	31
		% within	0,6%	6,5%	2,9%	0,0%
	4	Tutin	76	5	18	99
		% within	6,8%	5,1%	8,2%	0,0%
Total		Count	174	33	22	229
		% within	76,0 %	14,4 %	9,6 %	100, 0%

Table 6

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	35,129[a]	6	,000

a. 4 cells (33,3%) have expected count less than 5. The minimum expected count is 2,88.

Table 7
Chi-Square Tests

		PDKYPH		
		0	1	Total
Town	1 Sjenica	29	1	30
	% within	96,7%	3,3%	100,0 %
	2 Novi Pazar	66	3	69
	% within	95,7%	4,3%	100,0 %
	3 Raška	30	1	31
	% within	96,8%	3,2%	100,0 %
	4 Tutin	96	3	99
	% within	97,0%	3,0%	100,0 %
Total	Count	221	8	229
	% within	96,5%	3,5%	100,0 %

Table 8 Kyphosis -PDKYPH

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	,221[a]	3	,974

a. 4 cells (50,0%) have expected count less than 5. The minimum expected count is 1,05.