

The Incidence of Vertebral Static Disorders at Children Aged 11-14 Years

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Abstract: *Disorders of the osteo-musculo-articular system represents one of the most frequent pathological manifestations, both in terms of morbidity and economical costs. Therefore it is necessary an assessment of level of physical development and health status, based on medical examinations of physical balance in children from school communities. For this purpose, the initial evaluation of children by physiotherapists, through various tests and measurements specific for physical therapy, has a fundamental role in order to detect those with deficiencies (Lafond et al., 2007). The appreciations are made in conjunction with the data collected from medical records, and with the information about social and family context of respective subjects. The purpose of the study is to draw attention to the incidence of spinal postural impairments, within the same age group, and to its possible consequences for the adolescence and adulthood. In the context of medical recovery, physiotherapy plays a vital role in restoring the functionality potential of people with different conditions of incapacity. The study was carried out during the time of children's evaluation at the beginning of the 2019 school year. The research included 75 children aged 11-14 from Special Middle School No. 3 in Bucharest. The methods used are: method of bibliographic study, observation, method of evaluation, and recording of data and graphical presentation. From the 75 children evaluated, 70.67% had static vertebral disorders. The author consider that the school population is currently at risk of spinal disorders associated with sedentarism and abnormal body postures in both static and dynamic activities.*

Keywords: *incidence; spinal postural impairments; special education system.*

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1. Introduction

The existing topic of detecting, preventing and correcting vertebral postural disorders among the school population, is a current concern for both parents and teachers who are raising and educating these age groups.

Vertebral postural impairments are characterized by different degrees of evident morphological changes, which occur in the shape and structure of the body, manifested by a developmental disorder or a disproportionate development, by deviations, structural deformities, followed or preceded by functional disorders.

The posture, as it is defined by Cordun (1999a, pp. 59-64) "is a function of the human body based on the synergic and coordinated action of the elements of the locomotor system and of the central and peripheral nervous system through which it is maintained: stability of the body, equilibrium and constant relations between the segments of the body as well as between the body and the environment surrounding".

Non-dynamic vertebral diseases are one of the biggest problems in school age, sometimes seriously affecting the health of the future adult. Child's body is in a constant state of development and growth is unequal, alternating periods of sudden growing with a slowing down development rate.

During the growth and development of a child, 3 critical periods can be highlighted: from 2 to 3.5 years, between 6-9 years and at puberty.

Specialized literature shows three phases in the development of spinal deformities: the first phase is characterized by functional insufficiency of the neuromuscular system; the second phase - called the deformation fixation phase - is characterized by the deformation stabilization. The third phase is the modification of the musculoskeletal system, being closely related to the modification of the skeleton itself.

National studies showed that the disease of the vertebral posture are one of the most serious problems, arising from school age, considerably affecting child's health.

According to the Journals of School and University Medicine, out of the 99 students studied in two schools in Craiova, only 1.01% presented correct postural position (Cioviță et al., 2016, p. 5).

In recent years, more and more studies have focused on assessment of body posture in children with intellectual disability. The authors demonstrated that intellectually disabled children tend to present a poor body posture. In the entire group, regardless of the degree of disability, only

7.7% of boys and 7.1% of girls had good body posture, while the remaining subjects had poor posture or posture-related defects, and 65.5% had bad posture.

The authors also reported that postural defects were significantly more often associated with the spine, and less frequently with the lower limbs. Most of the boys and girls, with either moderate or severe disability, presented with abnormal lateral curvatures of the spine.

However, abnormalities in the lower limbs, including foot deformities, were found in 44.4% of the boys and in 61.9% of the girls (Wolan-Nieroda et al, 2018). Another analysis of the research results shows that more than half of the students with mental disabilities (63%) have physical deficiencies in the spine and only for 37% of them have a correct posture.

From the total spine deficiencies, there was a higher incidence of the scoliosis (Powers et al.,1983), followed by the kyphosis. In a smaller percentage, there were the kypholordosis, lordosis and kyphoscoliosis. The middle school age category (puberty) is the most affected by the presence of the spine deficiencies, followed by the low school age category, which is quite worrying. In boys, the deficiencies in the form of kyphosis and scoliosis also predominate, while in girls, the scoliosis dominates (Gulap et al. 2018).

One study conducted at the level of special schools in Bucharest mentions that 33% of students involved in the recovery program during physical therapy classes have vertebral static disorders (Șuță et al., 2017). Body posture in subjects with intellectual disability was also assessed by Momola and Czarny (2011), who studied a group of 201 subjects, (12–18 years) presenting with severe intellectual disability. The assessment focused on body posture in frontal and sagittal plane, as well as position of the lower limbs; the latter was examined for defects such as knocked knees, bow legs, low-arch foot, flat foot, and flat foot with valgus deformity. Morphological structure of feet was examined using plantographic method.

The authors demonstrated that intellectually disabled children tend to present themselves with poor body posture. In the entire group, regardless of the degree of disability, only 7.7% of boys and 7.1% of girls had good body posture, while the remaining subjects had poor posture or posture-related defects, and 65.5% had bad posture. Momola (2007) also assessed body posture and leg shape in a group of girls with mild or severe intellectual disabilities. The study group consisted of 426 girls (aged between 8 and 18 years).

The author showed that most girls with severe disabilities (over 45%) had poor body posture, while girls with moderate intellectual disabilities had better body posture. Postural defects were significantly more often associated with the spine, and less frequently with the lower limbs. Most of the boys and girls, with either moderate or severe disability, presented with abnormal lateral curvatures of the spine.

However, abnormalities in the lower limbs, including foot deformities, were found in 44.4% of the boys and in 61.9% of the girls (Momola 2007). The analysis of body posture was also investigated in a study conducted by (Kuzdzal et al.,2004) which assessed body posture in a group of 108 students with intellectual disabilities, aged 11-13 years, confirming that children with intellectual disabilities frequently presents abnormalities in body posture.

In many countries, due to the lack of national programs for the detection of vertebral static disorders, statistical data are based on information provided by advisory centers and specialized orthopedic clinics, which usually address patients with severe scoliosis, who require only surgical treatment. These children are not treated properly and in time they are becoming future low back pain adults, as confirmed by national and international statistics.

Such conclusions drawn over time should raise an alarm system about the incidence of vertebral static disorders among the school population, which is not only a medical problem but also a social one on direct costs for prevention, treatment, rehabilitation and long-term care. In order to reduce the number of vertebral static disorders among the school population, it is necessary to implement national prophylactic programs and for this purpose an essential role for the prophylaxis/treatment of these children is played by physiotherapy, which will take into account the age and level of development of the child.

For the treatment of all spinal deformities, the goal is to maintain function and prevent short and long-term symptoms (Weiss, 2010). Objectives of physical therapy are correlated with pathological changes of musculoskeletal apparatus and the final purpose is improving the quality of life of children (Negrini et al. 2011).

Physical therapy applied in schools for children with disabilities aims to recover students with locomotor deficiencies and neuro-motor disorders (central or peripheral), grafted on severe, profound and/or associated mental deficiencies or on the background of sensory deficiencies (hearing, vision impairment).

The physiotherapist must work within a health care team, including a psychologist, orthotist, orthopedic and specialist medical rehabilitation. Specific physical therapy exercises should be tailored to the child's individual pattern of curvature and treatment phase. Individual therapy should be reviewed regularly and systematically (Kotwicki et al., 2013).

In this article, I wanted to show the type of defect existing in the vertebral grafted types of shortcomings mentioned above, evaluating children of age between 11 to 14 years, during assessment from the start of the school year. I did this through a comprehensive evaluation, to highlight the incidence of disorders of static spine in these children, classifying these deficiencies by shape, age and sex gender of children and by the degree of deficiency.

The final purpose is to obtain a database comprising the specificity of this frequently met problem among school population. Equally important, I believe that this register will be extremely beneficial in monitoring the somatic-functional development of these children, their personal autonomy and social inclusion.

2. Problem research

The subject of vertebral static disorders at children is of current interest, given the complexity of the term “educational needs/special education” and the importance of acquiring/maintaining a correct posture of the body, that can be affected by various temporary or permanent physical or psycho-sensory dysfunctions, determining states of infirmity, disability, handicap or invalidity. Children with special educational needs are those whose requirements mainly derive from the mental, physical, sensory, language, emotional and behavioural deficiencies or are associated with, regardless of their severity. Under the current conditions, when trying to integrate as many children with special educational needs from special education into mass education, to achieve the best results for them, works multi-and interdisciplinary teams (Gulap et al. 2018).

3. Research Questions

In this research I intended to check, after an application of a protocol assessment at the beginning of the school year, the results on the incidence of disorders of static spine in children of age between 11 to 14 years with special educational needs.

The theme highlights a tangible reality in this complicated problem. The results can provide a real database that can be used later for various purposes.

4. Purpose of the research

The purpose of the study is to detect static spine disorders at school children aged between 11-14 years in special education, and to signalize the incidence of this condition and warn the consequences for teens and adults. The aim of the paper is also to create a database on the incidence of vertebral static disorders in children with special educational needs or in children with mental disabilities.

5. The Objectives of this research are:

1. Going through a literature search on the incidence of postural spine disorders in children.
2. Setting the level of knowledge by summarizing some general information about the physical deficiencies in children with intellectual disabilities (Tătaru 2019).
3. Evaluating body appearance of children with intellectual disabilities enrolled in special education.
4. Highlighting the percentage difference between disorders of static spine in children with intellectual disabilities, related to the degree of deficiency.
5. Calculation of body mass index in children included in the study group.
6. Comparing the incidence of vertebral static disorders according to the gender of the subjects chosen in the program.

6. Hypothesis of the research

In developing this study we started from the hypothesis that detection of physical impairments in two categories of students with mental disabilities.

a) students with mild / moderate mental disabilities in comparison with:

b) students with severe/profound mental impairment allows the identification of percentage differences in terms of incidence of vertebral static disorders for these two categories of subjects. Also early detection of these static vertebral disorders in children can prevent/ameliorate the serious consequences for adolescence and adulthood.

7. Materials and method

In my scientific approach, I used the following research methods:

1. Study of the literature and selection of statistics related to the incidence of vertebral static disorders in the school population.
2. Carrying out measurements and evaluation tests for the detection of vertebral static disorders.
3. Identification of spine segments anomalies due to general or body posture assessment at children with intellectual disabilities.
4. Calculation of body mass index. The assessment of normal weight and height in children and adolescents between 2 and 20 years of age. (Centers for Disease Control and Prevention -CDC).
5. Data analysis, processing and interpretation.
6. Formulation of conclusions.

8. Subjects and location

The study was conducted on a sample of 75 children aged 11-14 years (mean age 13 years) from Special Secondary School no. 3 from Bucharest. The group of children consisted of 47 pupils with mild/moderate mental disabilities and 28 children with severe/profound mental disabilities. (Table 2). The evaluation was performed during the physiotherapy program at the beginning of the 2019 school year.

9. Research Methods

1. Evaluation of the musculoskeletal system through which the assessment of physical growth and development is performed by subjective methods - somatoscopy - and by objective methods - somatoscopic examination instrument. To determine the incidence of the vertebral static disorders in children with mental deficiency through a detailed evaluation consisting of general somatoscopic examination and instrumental somatoscopic examination, respectively with the anthropometric symmetry framework. The anthropometric frame of symmetry (AFS) according to the parameters in the literature (Cordun, 1999b, pp.92-152): dimensions: 2 m high and 1 m wide. Grading was performed horizontally from the middle, from the zero point (0) to the right and to the left, from 10 to 10 cm, and vertically from the bottom upwards, from 0 to 200 cm. Thus, the anthropometric symmetry frame is divided into squares with sides of 10 cm. The middle vertical from the zero points (00) overlaps the median line of the body. The instrumental somatoscopic examination was performed, as it is stated in the literature, from the back, face and profile. The front and back

examinations provided information on the specificities of the deficiencies occurring in the frontal plane, respectively the scoliosis, and the examination revealed the specific aspects and defining characteristics for the deviations of the spine in the sagittal plane, namely the kyphosis, lordosis and their combinations.

2. For the assessment of normal weight and height in children and adolescents between 2 and 20 years of age, it is recommended to use growth charts corresponding to sex and age issued by the Centers for Disease Control and Prevention (CDC) (Onea & Balint, 2017). Data on the body mass index (BMI) were collected by the school nurse and the physiotherapist at the beginning of the school year (2019-2020) and were introduced in the Children's BMI tool for schools (excel sheet), downloaded from the CDC (Centers for Disease Control and Prevention) website. According to the CDC, BMI is divided by the following criteria: underweight (<5th percentile), normal BMI (5th -85th percentile), overweight or obese (\geq 85th percentile), obese (\geq 95th percentile). Studies using the CDC method reported different overweight and obese percentages for schoolchildren (Table 3).

Also, there were studied medical records of children who have provided important information about personal data, diagnose of mental disabilities, degree of disability, chronic illness and various observations on the child's activity, which, together with the assessment showed an overview of each case.

10. Results

Data analysis were performed using the Excell program. The main vertebral static disorders encountered in children with intellectual disabilities and the number of children for each category (Table 2). The distribution of children in the studied group shows the predominance of girls 56% (n = 42) compared to boys 44% (n = 33). The gender distribution is relevant in the case of scoliosis, with a greater incidence at women, in a proportion of 33%, as stated and other studies (Kusturova, 2016).

Incidence of the disorders of vertebral statics in children with mental deficiency

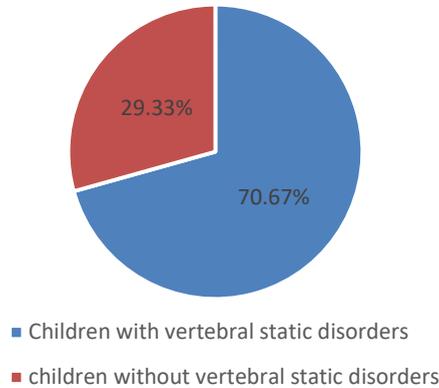


Figure 1. Incidence of the disorders of vertebral statics

Source: figure arising from the original research activity

From the graph above, we can see that out of the total number of children evaluated in research, only 29,33% had a correct postural position and 70,67% suffered from a vertebral static disorder, and 7 had severe back pain.

Classification of the disorders of vertebral statics according to frontal or sagittal deviations, respectively in scoliosis, kyphosis or lordosis and/or combinations

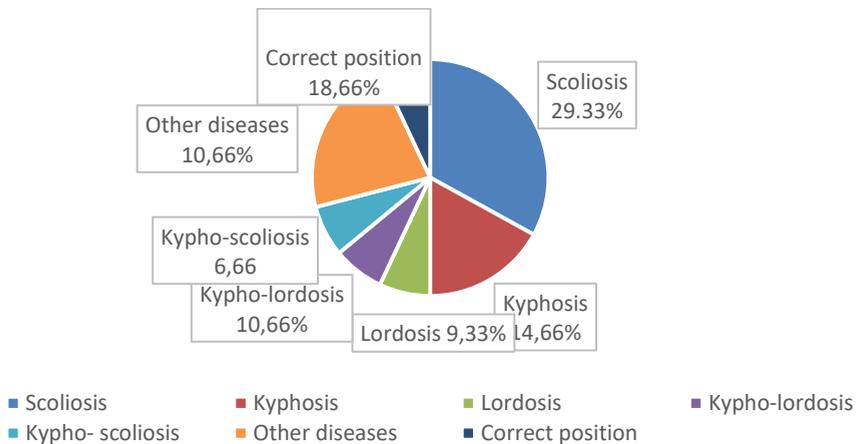


Figure 2. Classification of the disorders of vertebral statics

Source: figure arising from the original research activity

The main disorders of vertebral statics seen in children with intellectual disabilities in order of frequency, were: scoliosis 29,33% of subjects, kyphosis 14,66% of subjects, kypholordosis 10,66% of subjects, hyper lordosis lumbar proportion 9,33% and kyphoscoliosis 6.66% of subjects. (Table 1)

Table 1. Incidence type disorders of vertebral statics and sex of subjects

Source: original data resulting from research

<i>Disease</i>	<i>Subjects</i>		<i>Male</i>		<i>Female</i>	
	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>
scoliosis	22	29,33 %	8	24.24%	14	33,33 %
kyphosis	11	14.66 %	4	12,12 %	7	16.66 %
Lordosis	7	9,33 %	4	12.12%	3	7.14 %
Kypho-lordosis	8	10.66 %	5	15.15 %	3	7.14 %
Kypho- scoliosis	5	6.66 %	2	6,06 %	3	7.14%
Correct position	14	18.66%	5	15.15%	9	21,42 %
Other diseases	8	10.66%	5	15.15%	3	7.14%
Total	75	(100%)	33	100%	42	100%

Source: original data resulting from research

Table 2. The incidence of vertebral static disorders based on the degree of deficiency

Source: original data resulting from research

<i>Disease</i>	<i>No. subjects</i>	<i>Type of deficiency</i>			
		<i>MD</i>		<i>MS</i>	
		<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>
Scoliosis	22	18	38,29 %	4	14.28 %
Kyphosis	11	4	8.51 %	7	25%
Lordosis	7	5	10.63 %	2	7,14%
Kypho-lordosis	8	3	6.38 %	5	17,85 %
Kypho- scoliosis	5	4	8.51 %	1	3.57 %
Other diseases	8	3	6.38 %	5	17.85 %
Correct position	14	10	21.27%	4	14.28%
Total	75	47	62.66%	28	37.33%

Abbreviations:

MD - children with moderate mental deficiency.

MS - children with severe mental deficiency.

Source: original data resulting from research

The group of children consisted of 47 pupils with mild/moderate mental disabilities and 28 children with severe/profound mental disabilities. Scoliosis (38.29%) predominates in children with mild mental deficiency and kyphosis (25%) predominates in children with severe/profound mental deficiency.

Distribution of the vertebral static disorders at boys.

The distribution of the spine deficiencies at boys (Figure 3) shows that: 24,24% are scoliosis, 12,12% kyphosis and lordosis are equal to 12,12%, 15,15% kypholordosis, and kyphoscoliosis only 6.06%.

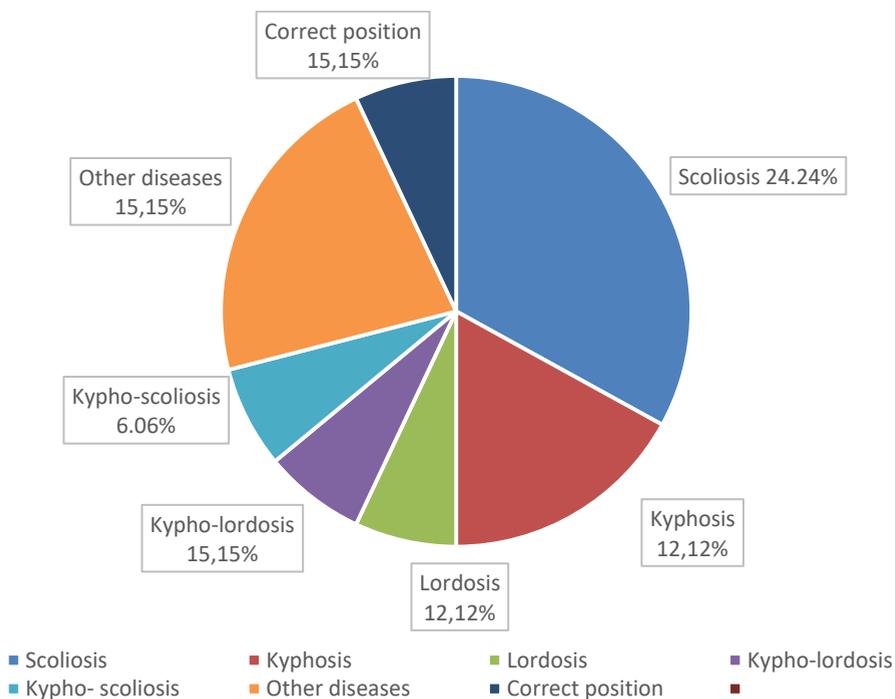


Figure 3. Distribution of the vertebral static disorder at boys.

Source: figure arising from the original research activity

Distribution of the vertebral static disorders at girls.

The deviation of the spine in the frontal plane, respectively the scoliosis, is placed on the first place in girls, with 33.33%. Other values recorded in figure 4 show that: 16,66% have kyphosis, the lordosis, kypholordosis and kyphoscoliosis to equality, 7.14%.

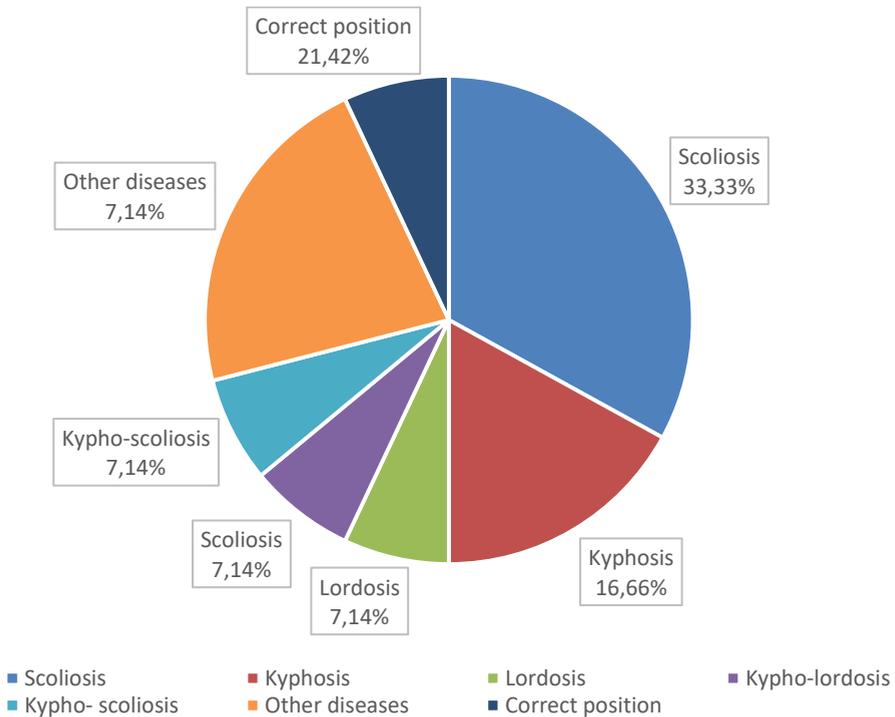


Figure 4. Distribution of vertebral static disorder at girls

Source: figure arising from the original research activity

Regarding the fact that the status influences the position and alignment of the body weight, we calculated S and parameter - Body Mass Index (BMI), resulting in the values listed in Table 3. In the study group only 45% had a normal BMI, the remaining 27 % were overweight, 16 % underweight and 12% of the obese. 77,77% (n=7) from the obese subjects have been diagnosed with lordosis and suffered low back pain.

A weight higher than normal - whether we are talking about overweight or obesity - leaves its mark on the spine.

Table 3. Summary of children's BMI by gender
(original data resulting from research)

BMI	Boys	Girls	Total
Number of children assessed	33	42	75 (100%)
Underweight (<5th percentile)	6	6	12 (16%)
Normal BMI (5th -85th percentile)	15	19	34 (45%)
Overweight or obese (≥ 85th percentile)	8	12	20 (27%)
Obese (≥ 95th percentile)	4	5	9(12%)

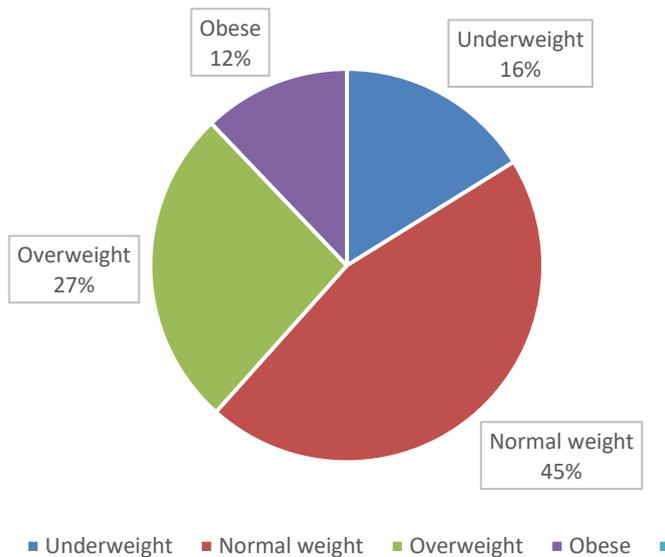


Figure 5. BMI subjects repartition

Source: figure arising from the original research activity

10. Conclusions

1. At national level, vertebral postural diseases represents one of the biggest problem found at school age, these affecting, very seriously sometimes, the health of the future adult, evidencing the need for national prophylactic programs.

2. The results shows that more than half of the mentally deficient pupils (70,67%) have vertebral postural disorders. Only 29,33% of them do not present this type of impairments.

3. The most affected in terms of vertebral postural pathology is the category of average school age (puberty), as confirmed by other specialized statistics.

4. Analyzing data from Table 1 and Table 2, we could conclude that from 75 students tested:

- in category children with moderate mental deficiency (MS) only 4 subjects have good posture. In this category is prevailing kyphosis.

- in category children with severe mental deficiency (MD) only 10 subjects have a correct posture; scoliosis predominates at girls.

5. From the total vertebral static spine disorders, there was a higher incidence of the deviations in the frontal plane, respectively the scoliosis, followed by the deviations in the sagittal plane, respectively the kyphosis. In

a smaller percentage, there were the kypholordosis, lordosis and kyphoscoliosis.

6. Obesity is very rarely the only cause of back pain, but it is often a factor that aggravates pre-existing pain; 7 children out of 9 obese have reported lumbar pain during static and dynamic activities.

7. This high percentage of children with spinal static disorders should draw the attention of parents, teachers and specialized institutions.

8. The evaluation file has led to impartially results, which constitutes an actual database of the spine deficiencies in children with mental disabilities, leading to the confirmation of originally hypothesis.

11. Motions

1. It is necessary to carry out a school screening on vertebral static disorders in age groups at risk: 7-11 years, 10-14 years (prepuberty) and 15-18 years (adolescent).

2. The role of physical therapy is essential for improving the health of these children.

3. Prevention of childhood obesity is an international priority in the field of public health (Waters et al., 2011). Parental participation is a key factor in the prevention and management of childhood obesity (Junaibi et al., 2013). Overweight or obese people are not aware that being overweight can cause pain. Any extra weight in this case increases the pressure on the spine

4. Obesity in children is associated with unhealthy nutrition, inactivity and low physical fitness, that may contribute to increased risk of fractures (Valerio et al., 2012). It has been shown that overweight children and adolescents have a greater risk of sustaining these fractures than leaner children (Yamamoto et al., 2010).

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