

Clinico-functional study on the incidence of physical deficiencies in teenagers

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Abstract

This paper assesses the incidence of static disorders of the spine among teenagers. The study also aims at demonstrating the degree of correlation between functional evaluation of posture – through posturography – and the imagistic evaluation of the spine. The study sample comprised 250 teenagers aged between 12 and 18, who addressed to the medical clinic for a set of tests, including postural evaluation. The investigation comprised 250 teenagers aged between 12 and 18, who addressed the medical clinic for a set of tests, including postural evaluation. From among them, 63.20 % were male and 36.8% female; the age mean of the entire sample was 14.8. The statistical analysis conducted on the sample of posturally assessed subjects has found that the most common deviations are those manifested by vicious attitudes; the first are scoliotic attitudes, with 67.2% of the 84% of vicious attitudes encountered during the investigation.

Key words: *scoliosis; postural evaluation; spine*

Rezumat

Prin această lucrare ne-am propus să verificăm frecvența tulburărilor de statică vertebrală în rândul adolescenților și tot în cadrul acestui studiu dorim să demonstrăm gradul de corelație dintre evaluarea funcțională a posturii cu ajutorul posturografiei și evaluarea imagistică a coloanei vertebrale. Studiul s-a realizat pe un număr de 250 de adolescenți cu vârste cuprinse între 12-18 ani ce s-au adresat clinicii medicale în vederea efectuării unui pachet de analize ce a cuprins și evaluarea posturală. Dintre aceștia 63,20 % au fost de gen masculin și 36,8% de gen feminin, cu o medie de vârstă a întregului lot de subiecți de 14,8 ani. Din studiul statistic efectuat pe lotul de subiecți evaluați postural am ajuns la concluzia că deviațiile cel mai des întâlnite sunt cele care se manifestă sub forma atitudinilor vicioase, pe primul loc situându-se atitudinile scoliotice, cu un procent de 67,2 % din cele 84% atitudini vicioase întâlnite.

Cuvinte cheie: *scolioză; evaluare posturală; coloană vertebrală*

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During puberty, an important incidence of postural alterations was found, at the level of both the spine and the other segments. If neglected, they can lead to deficiencies and even deformities. Furthermore, high incidences of body posture alterations were found, which were labelled *vicious attitudes* (deficiencies), characterized by spine curvature accentuation or by the emergence of abnormal curvatures, accompanied by wrong position of head and neck, shoulder and abdomen.

Scientific investigations have been conducted to analyze spinal position of students, and they warn that 80% of the students have an altered body position. These studies have also found that approximately 10% of these children present structural deficiencies, 25% do not have postural deviations, while 45% of the children investigated present mild postural deviations. (1)

Other studies report that our country has high rates of structural spinal deficiencies among teenagers.

Statistics show that, in Romania, there are numerous cases of spinal deficiencies that require specialized medical intervention. Hence, the “Grigore Alexandrescu” Clinical Hospital for Children (Bucharest) alone registered over 13,000 such cases (2).

Material-method

This paper assesses the incidence of static disorders of the spine among teenagers. The study also aims at demonstrating the degree of correlation between functional evaluation of posture – through posture-graphy – and the imagistic evaluation of the spine.

The purpose of this paper is to underline the importance of postural evaluation for teenagers, in order to prevent or correct vicious attitudes.

The investigation comprised 250 teenagers aged between 12 and 18, who addressed the medical clinic for a set of tests, including postural evaluation. From among them, 63.20% were male and 36.8% female; the age mean of the entire sample was 14.8. Hence, the selection was random; the only inclusion criteria were age and the tutor's consent on using the minor's medical data within this investigation.

Functional evaluation was performed with the help of a posturograph (*Global Postural System*), which is a system of advanced postural analysis. It uses non-invasive techniques and methods for evaluation and diagnostic in the field of medical recovery, by using a digital program to visualise and assess the data. The analysis involves an evaluation of the subject in

orthostatic position, from the front, the back and left/right profile, considering the somatoscopic frame of the posturograph (3-4). The testing comprised marking the classic reference points by using the round adhesive markers and by getting at least two images per testing position.

After getting the images, I processed the data; more precisely, I calculated, in degrees, the differences in symmetry between acromion markers (fig. 1), markers corresponding to lower shoulder blade angles, to anterior superior iliac crests (fig. 2), or the symmetry of gluteal folds. I measured the degree of spinal curving by calculating the linear value between the apex of each curve and the symmetry line within the software. I conducted the same assessment in sagittal plane (fig. 3) to assess the degree of kyphosis and hyperlordosis.

I measured the stature triangles by using the same special software, and I assessed both angular and linear values, in order to determine the level of each curve. Hence, acute angles highlight lumbar curvatures, while more open angles and bigger distances between arm and torso suggest dorsal curvatures.

In order to make the subjects aware of the degree of deficiency, I drafted a graphic representation of spinal position, by using the same software (fig. 4). Within the same study, I included an X-ray clinical examination for subjects who featured significant postural alterations at the functional evaluation. The purpose was to confirm or infirm the suspected structural alterations. I sent 31 subjects – who had important postural alterations in both frontal and sagittal plane.

Findings and discussions

Following the postural evaluation performed for 250 teenagers, only 20 subjects were found clinically healthy; 210 presented vicious attitudes, while 20 had structural deficiencies (Fig. 5). These percentages include all isolated or associated deficiencies or alterations encountered among the individuals within the investigation.

Lack of physical activity and wrong postures during classes and other daily activities have had a negative influence on paravertebral muscle tone, as well as on the passive spinal structures, such as ligament structures. The last became laxer and they allowed the teenagers to acquire wrong postures. In this sense, this study details the repartition of deficiencies by gravity and level.

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Figure 1. Front evaluation

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Figure 2. Back evaluation

Figure 3. Profile Assessment

Figure 4. Graphical representation of the spine

The evaluation by types of wrong spinal attitudes has found (Fig 6) a higher incidence of frontal alterations – 67.20%, among the 84% non-structural deviations, followed by kyphotic attitudes – 8.40%, kypholordotic attitudes – 5.60% and hyperlordotic attitudes – only 2.80%.

Considering the high rates of scoliotic attitudes, I detailed their incidence (Fig. 7) within the study: higher rates for dorsolumbar scoliotic attitudes – 23.60%, followed by thoracic attitudes – 21%, lumbar curvatures – 15% and double curvature alterations – 7.60%. Higher rates of dorsolumbar and dorsal alterations can also be explained by the fact that male subjects were more numerous (63.20%) than female subjects; we must also take into account the age mean: 14.8.

As for sagittal spinal deviations, in order to determine the degree of deviation, I analyzed mainly

the cervical and lumbar arrows, where I found more significant deviations, for which I also requested X-rays. Within this study, the mean height of subjects was 165.4 cm, while the mean cervical arrow measured 6.9 cm and the mean dorsal arrow: 6.3 cm.

Structural deviations were less frequent than postural deviations; only 8% of the subjects presented such alterations, and the main diagnoses were scoliosis and kyphosis.

In percentages, (fig. 8) most structural alterations were represented by C-shaped scolioses – 4%; dorsolumbar scolioses – 1.2%; lumbar scoliosis – 0.8%; thoracic scoliosis – 1.2 %; lumbar curvatures reversals (lumbar kyphosis) – 0.8%.

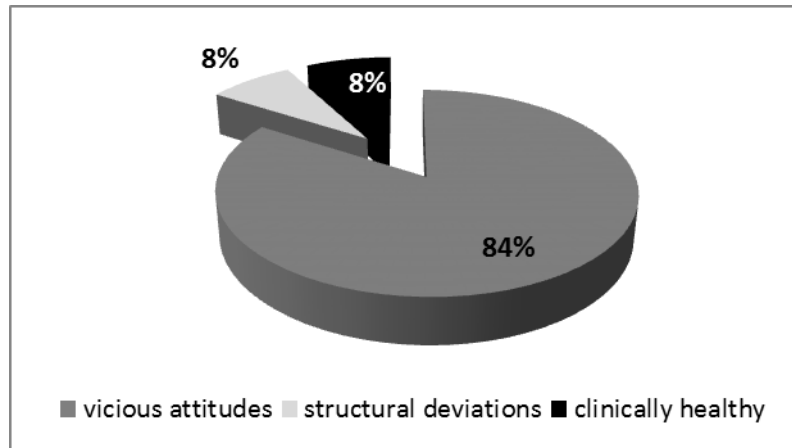


Figure 5. Graphical representation of static spinal changes

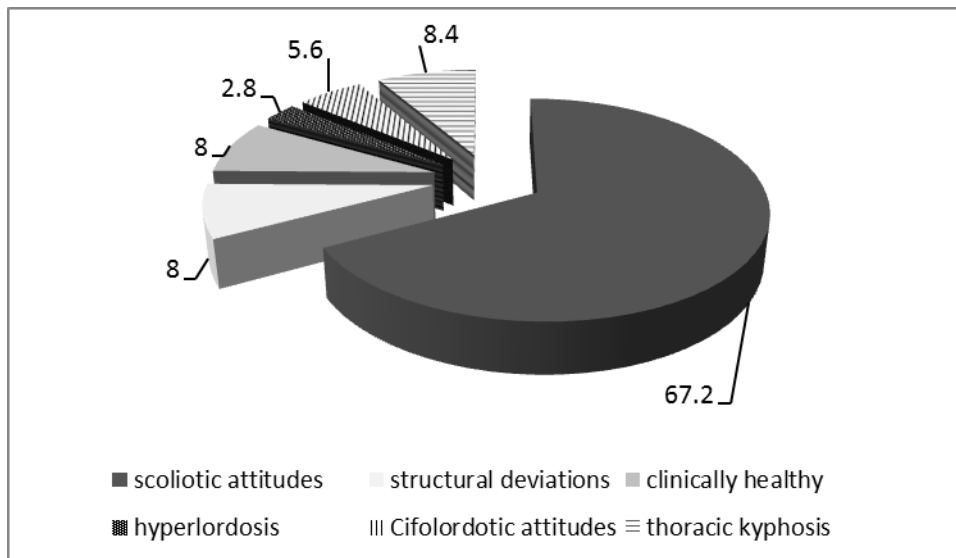


Figura 6. Graphical representation of postural changes depending on the type of deviation

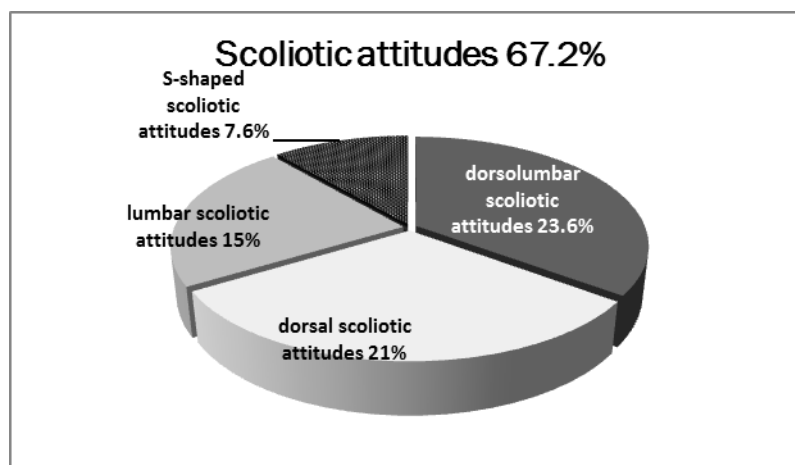


Figure 7. Graphical representation of scoliotic attitudes

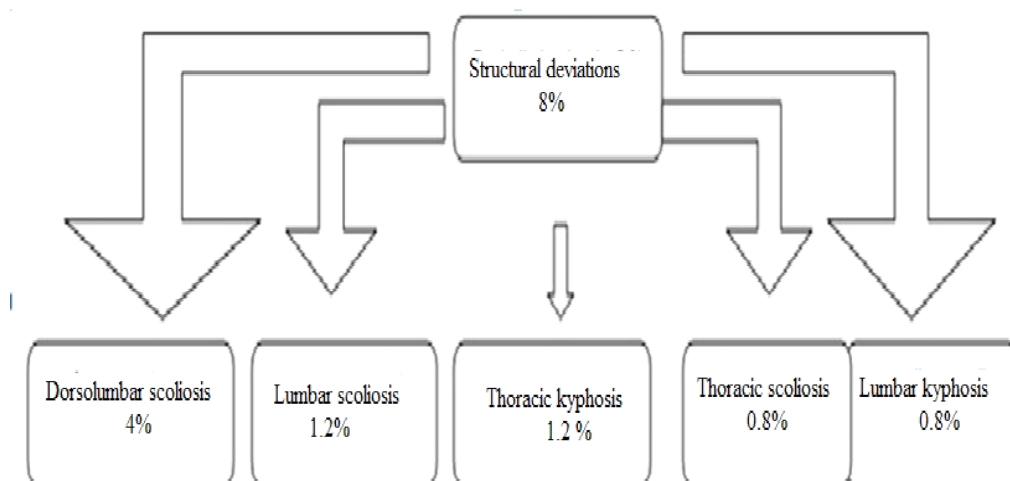


Figure 8. Structural bases spine distribution according to diagnosis

The correlation between functional evaluation with the help of the posturograph and the X-ray underline a close connection between these two types of evaluation; the findings also support this aspect. Hence, among the 27 subjects for which I advised X-rays to confirm or infirm the functional diagnostic, 20 cases were confirmed for structural deficiencies; 3 of the subjects showed important postural deviations, at the limit with Cobb angles of 17-19 degrees, while 4 subjects did not show any postural alterations on X-rays.

The last 4 subjects had a functional diagnostic of dorsolumbar scoliotic attitude, with 1.9 cm mean distance of curve apex to the symmetry line, which initially made me suspect a curve with Cobb angle of 20 degrees. The fact that the X-rays failed to find the same issues can be explained by the X-ray protocol, which involves the patient standing while taking a deep breath. The deep breath lifted the ribs and changed the curve, considering the lack of paravertebral muscle contractures and the ligament laxity at this level.

Conclusions

The statistic study conducted on the sample of subjects who underwent a postural analysis has found the that the most common deviations are those manifested by vicious attitudes; the first are scoliotic attitudes, with 67.2% of the 84% of vicious attitudes encountered during the investigation.

The postural spinal deficiencies must be analyzed in the global context of postural deviations and

segment deviations, in order to rule out other causes and to obtain a correct and solid correction of the rachis.

The use of non-invasive functional evaluation methods for posture must be included among the periodical examinations for teenagers, to pinpoint, analyze or monitor the postural alterations emerging in this period.

Postural evaluation – mostly for teenagers – is important because a spinal deviation diagnosed in time can be treated by correct kinesiotherapeutic programs. On the contrary, lack of monitoring concerning teenagers' growth can become a favouring factor for ongoing postural deviations, in the absence of specialized intervention.

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