# Spinal flexibility and physical disability status in patients with cerebral palsy

## (Serebral paralizili hastalarda spinal fleksibilite ve fiziksel özürlülüğün değerlendirilmesi)

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*Serebral Paralizili hastalarda spinal fleksibilitenin fiziksel özür düzeyine etkisini belirlemek amacıyla planlanan bu çalışmaya yaş ortalaması 7.2 olan 30 serebral paralizili ve yaş ortalaması 7.6 olan 30 normal çocuk dahil edilmiştir. Spinal fleksibilite Cybex EDI 320 inklinometre ile; fiziksel özür düzeyi de Gross Motor Function Measure (GMFM) testi ile değerlendirilmiştir. Sonuç olarak serebral paralizili çocuklarda spinal fleksibilitenin kontrol grubuna göre limitli olduğu (p<0.001) belirlenmiş ve fiziksel özür düzeyi ile olan ilişkisi de oldukça yüksek bulunmuştur (r=88 -0.96)*

***Anahtar kelimeler:*** *Spinal kolon, fleksibilite, serebral paralizi, fiziksel özürlülük*

***Spinal flexibility and physical disability status in patients with cerebral palsy***

*Objective: To determine the effect of spinal flexibility on physical disability status of patients with cerebral palsy (CP). Design: In this study, physical disability and thoracolumbar spine forward flexion, flexibilities of two groups of normal and CP children were evaluated using Gross Motor Function Measure (GMFM) and Cybex EDI320, respectively. Setting: Riyadhy, King Saud University, Faculty of Applied Medical sciences. Subbjects: Two groups of normaal and CP children with mean age 7.2 and 7.6 years respectively participated in the study. Results: showed that spinal flexibility in the group of cildren with CP was significantly impaired as compared to the normal group (p<0.001). It also showed strong association between spinal flexibility and physical disability status (r=88 - 0.96). Conclusion: Impairment in spinal flexibility contributes to the degree of physical disability status in this group of children with CP.*

***Keywords:*** *Spine, flexibility, cerebral palsy, disability*

Impairment in spinal flexibility has been repored to interfere with attainment of important functional skills and activity i.e. walking, dressing, transfer, running etc. (1). Because of that, assessment of spinal flexbility has been considered as an important factor of overall good health (2), as a part of physical fitness test (3) and as part of physical rehabilitation programme. Spinal flexibility for normal children and children with various problems has been documented in the past years (1, 4, 5). Unfortunately, spinal flexibility of children with cerebral palsy (CP) has not been evaluated, although the CP is one of the most common problems in the world and its symptoms and signs contribute to impair spinal flexibility (6). Symptoms of spasticity, muscle weakness and body balance impairment have been considered the main causes for physical abnormalities in patients with CP (6, 7). One of these abnormalities is trunk posture impairment or deficit. Clinically, it has been noticed that most of the patients with spastic diplegic CP develop a compensatory abnormal forward and/or flexion postures (Kyphotic, scliotic and Kyphoscliotic postures) due to abnormal muscle tone and lack of stability and balance. Such compensatory postures - if not managed properly - are reported to turn into a gradual fixed deformities (8) which therefore could cause impaired spinal flexibilty, restriction in lung expansion resulting in respiratory and speech impairment (8). It also could move the center of the gravity out of the base support resulting instability of the body during daily living activity (8). Although, spinal flexibility clinically plays a very important role in maintaining and improving daily living activity of children with CP., as mentioned above, there is no study comparing spinal flexibility in normal children with children with CP and examining the relationship between spinal flexibility and physical disability status in people with CP. Therefore, this study was planned to compare spinal flexibility in normal children with that of children with spastic diplegic CP and to determine the relationship between spinal flexibility and physical disability status in children with spastic diplegic CP.

## Patients and method

Two groups of children participated in this study, experimental and control groups.

Experimental group: Thirty children (20 males and 10 females) with diplegic spastic CP were identified from the Paralysed Children Institute. Their mean age was 7.6 (SD = 2.2) years. They all ere able to follow instructions adeqiately to allow the testing of trunk flexibility. They did not complain of back pain. Fifteen of them had spinal kyphosis and the rest had either lordosis (7 children) or kyphoscoliosis (8 children). Theses spinal abnormality were passively correctable. They all ere able to maintain standing with aids and alk on level floor using various types of aids.

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| Spine movements | Control group | Patient group | % difference | p-vayue |
|---|---|---|---|---|
| Forward flexion | 75 ± 11 | 30 ± 9.9 | 60 % | p<0.001 |
| Backward extension | 38 ± 10 | 20 ± 5.9 | 47 % | p<0.001 |
| Lateral flexion | 30 ± 8 | 15 ± 3.9 | 50 % | p<0.001 |

Table 1: Forward flexion, backward extension and lateral flexion and lateral flexion of thoracolumbar flexibility for the control and expermintal groups (in degrees; ± SD).

| Control group | expermintal group |
|---|---|
| 100 % ± 5 | 53 % ± 16 |

Table 2 : GMFM for control and expermental groups (mean ± SD).

Control group: Thirty normal children (21 males and 9 females) with mean age 7.2 (SD = 2.8) years participated in this study. They did not have history of motor delay, serious back pain or abnormal posture deformities such as kyphosis, lordosis or scoliosis

Procedure: In the study, spinal flexibility and physical disability status were evaluated in the early morning for each subject.

The spinal flexibility was measured using Cybex EDI 320 inclinometer. The examiner explained the procedure of the study and demonstrated the movements required during testing to each shild. The spinal flexibility measured in this study was thoracolumbar flexibility. The tested movements were (1) forward flexion, (2) backward extension and (3) lateral flexion of thoracolumbar region.

The procedure for measuring the forward flexion, bakward extension and lateral flexion of thoracolumbar region were similar to that presented by A1 Abdulwahab (7).

Briefly, they were as follow: The child was asked and helped to take off his/her clothing except for gym short. The child was secured with fasten belt around the pelvis and legs and then left for a while untul abnormal activity was reduced. Then the examiner adwusted the subject's standing posture until suitable alignment with the anteroposterior and lateral virtical gravity lines of the body was obtained (9). The child was then asked and helped to stay still. Thereafter, the compound mode of the inclinometer was selected to measure spinal flexibility. The examiner placed the hand-held unit of the inclinometer on spinous process of Cervical 7 and Sacral 1 as described in the Cybex EDI 320 user's handbook (10) and Al Abdulwahab (7). Lastly, the child was asked and guided to perform forward flexion, backward extension and lateral flexion to convexity side of the thoracolumber region, respectively. Three readings of each movement were recorded and the average was taken. The child was encouraged to do the movement as far as he/she could, without bending the knees and lifting feet off foot rest.

The physical disability status for each child was assessedu sing the gross motor function measure (GMFM). The GMFM was filled and calculated as described by Russell et al (11). The study was revised and ethically approved by the paralysed Children

| Spine movements | GMFM |
|---|---|
| Forward flexion | 0.96* |
| Backward extension | 0.89* |
| Lateral flexion | 0.88* |

Table 3 : The correlation coefficient between GMFM and spinal movements *p<0. 001

Institute. A signed informed consent agreement was obtained from each child's parent prior to participation.

The data of this study were statislically analysised using paired test and correlation coeficient. The paired test was used.to compair between spinal flexibility in experimental and control groups. It also used to compair GMFM scores in experimental and control groups. The correlation coefficient test was calculated to show the degree of relationship between GMFM scores and spinal flexibility.

## Results

Gnerally spinal flexibility of the experimental group was severely impaired in comparison with the control group (Table 1). The mean forward flexion for control group was 75 ± 11 degrees and 30 ± 9.9 degrees for the experimental group. On the other hand, the mean backward extension for control and expermintal groups 38 ± 10 degrees and 20 ± 5.9 degrees respectively. The control group had a mean of 30 ± 8 degrees lateral flexion. The experimental group had a mean of 15 ± 3.9 degrees lateral flexion. All of the tested spinal movement in control group were statistically significantly different from that in expermental group (P<0.001).

The mean Gross motor function measure for experimental group was very low (53% ± 16). This was almost equal to half of the sontrol group (100% ± 5), indicating severe physical disability status (Table 2). The correlation coefficient test showed strong association beteen the GMFM of the experimental group and the forward flexion (r=0.96), backward extension (r=0.89) and lateral flexion (r=0.88_. These correlation were statistically significant (p<0.001) (Table 3).

## Discuosion

The methods used in this study to measure spinal flexibility and gross motor function have been reported to be reliable, relativelyy easier, sensitivi and quicker to perform than the other published methods (7, 11, 12). This could indicate that spinal impairment for each subject. It has already been known that increases in spinal flexibilty depend on proper combination of movement of the hip on the pelvis and the spine on the pelvis (13, 14).

It has also been decumented that spinal flexibility could be impaired if there are tightness, shortening or weakness in the muscle groups which control knee, hip, pelvis and spine joints (8, 13, 14). Patients with CP are reported to have poor combination of hip, pelvis and spine movements, to develop muscle shortening and weakness in various parts of the body due to abnormal motor control (6, 7, 8). Therefore, patients with CP have inherently associated limited spinal flexibility, This could explain why the experimental group had less spinal flexibility than the control group. The gross motor function in the expermental group was severely affected resulting in general physical disability. This was expected because of the motor function impairment associated with CP (6, 15).

The gross motor function measurement was used in this study to predict the degree of physical disability status. There was a statistically significant correlation between physical disability and spinal flexibility, indicating thad the degree of spinal flexibility in CP children reflects the extent of physical disability. In the light of this association, therapists should put more effort to improve spinal flexibility by emphasing proper positioning during the day and stretching exercises of all spine movemend and all of other joints related to spinal movements. All these should commence as soon as patients are recommended for rehabilitation programme. It is recommended that further study that will include more subjects with a broader spectrum of CP variety spould be conducted.

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