

Original Article

GROSS AND FINE MOTORS FUNCTIONAL IMPAIRMENTS IN CHILDREN WITH CEREBRAL PALSY:
A CROSS-SECTIONAL STUDY

Ramma Inam, Ehsan Ullah, Naeem Liaqat, Shazia Maqbool, Fouzia Rashid and Saba Aziz

Objective: To assess prevalence of gross and fine motor functional impairments in children with CP.

Methods: This cross sectional study was conducted at Department of Developmental & Behavioural Paediatrics, The Children's Hospital and Institute of Child Health, Lahore from October, 2014 to September, 2015. A total of 100 CP patients were taken to assess for gross and fine motor functional impairment, using Gross Motor Functional Classification System (GMFCS) and Bimanual Fine Motor Function (BFMF) scales. All data were analyzed using SPSS version 20.

Results: In this hospital-based study comprised 100 children with a diagnosis of CP with 2 to 8 years of age were ascertained. The mean age of patients was found as 4.090 ± 1.672 years. Study group included 32 females and 68 males. GMFCS was found at level I in 5% patients, level II in 18% patients, level III in 16% patients, level IV in 15% patients and level V in 46% patients. The corresponding percentages for BFMF were 21.7% patients, 18% patients, 15% patients, 13% patients and 33% respectively. Among oral musculature problems, drooling was the most common problem (68 %). Larger proportion of gross motor functional impairment were associated with the spastic type of cerebral palsy ($p=0.03$), more specifically quadriplegic cerebral palsy ($p=0.000$). Also a larger number of patients with fine motor functional impairments were associated with spastic type of cerebral palsy ($p=0.009$), more precisely quadriplegic cerebral palsy ($p=0.000$).

Conclusion: It is concluded that quadriplegic spastic CP was the most frequent type that had the worst motor impairment hence making patients functionally dependant in activities of daily livings.

Keywords: cerebral palsy; gross motor; fine motor; impairment.

Introduction

Cerebral Palsy (CP) is a non-progressive movement disorder, which has different types. CP is caused by an abnormality or disruption in brain development, in perinatal, natal or postnatal period.^{1,2} Classification of CP depends on movement impairments; topographical and according to severity.³ CP children along with other problems also usually have motor disturbances.⁴ There are two types of motor movements; fine and gross motor movements. To assess functional motor impairments in CP children Gross Motor Functional Classification System (GMFCS)⁵ and Bimanual Fine Motor Function (BFMF) have been used, both of these scales use a five-level system that corresponds to the extent of ability and impairment limitation. A higher grade indicates a higher degree of the severity.^{6,7} In Pakistan, prevalence data on motor impairments and activity limitations in children with CP has not been available until now. So we planned this study with

the objective to find prevalence of fine and gross motor functional impairments in children with CP.

Methods

After obtaining approval from our hospital's ethics committee, we conducted this cross sectional study at Developmental and Behavioral Paediatrics, The Children's Hospital and The Institute of Child Health, Lahore. It was one year study spanning from October, 2014 to September, 2015. We included all the diagnosed cases of CP with age range from 2 year to 8 years presenting to our hospital. Our exclusion criteria included: patients with co-morbidity; patients with other developmental disorders and syndromes for example autism; patients having attention deficient hyperactivity disorder. A total of 100 patients fulfilling these criteria were included in the study. All patients were assessed using GMFCS and BFMF for motor functions among CP patients. Statistical analysis of data was done on Statistical Package for Social Sciences (SPSS) version 20. Mean and standard

determined for all quantitative variables. Frequency and percentages were used to describe qualitative variables like age, types of CP. GMFCS and BFMF Chi square test was used to determine the relationship of demographic data and motor impairments (gross and fine) among types of cerebral palsy. P-value of ≤ 0.05 was considered statistically significant.

Results

The mean age of patients was found to be 4.090 ± 1.672 years. Of total 100 patients, 68 were males while 32 were females. The most common type of CP was found to be spastic type (79%) followed by athetoid and ataxic types. In spastic type of CP, according to the topographical classification, hemiplegic variety was 13.9% and quadriplegic were 68% of patients. (Table-1). Also we found that the most common type of spinal deformity in patients with CP was lumber lordosis (17%), most common oral musculature problem was drooling of saliva in 39% of children and most common contracture was of hip joint. All these data were summarized in (Table-2). When assessed for GMFCS, most of patients were at level V (46%), followed by level II (18%) and level III (16%). Similarly according to BFMF, most of patients were at level V (33%) followed by level I (22%) and level II (18%). (Figure: 1). The association of CP categories with GMFCS and BFMF was also determined. It had been found that larger proportion of gross motor functional impairment were significantly associated with the spastic type of cerebral palsy ($p=0.038$), more specifically quadriplegic cerebral palsy ($p=0.000$). Larger ratio of fine motor functional impairments were significantly associated with spastic type of cerebral palsy ($p=0.009$), more precisely quadriplegic cerebral palsy ($p=0.000$). (Table: 3, 4)

Table-1: Frequency of classification of CP based on movement impairment and topographical classification of cerebral palsy.

| Classification of CP based on movement Impairment | |
|---|------------|
| Spastic | 79 (79%) |
| Athetoid | 8 (8%) |
| Ataxic | 8 (8%) |
| Mixed | 5 (5%) |
| Total | 100 (100%) |
| Topographical Classification of Cerebral Palsy | |
| Hemiplegic | 11 (13.9%) |

| | |
|--------------|------------|
| Diplegic | 10 (12.7%) |
| Quadriplegic | 54 (68.4%) |
| Monoplegic | 4 (5.1%) |
| Total | 79 (100%) |

Table-1: Frequency of classification of CP based on movement impairment and topographical classification of cerebral palsy.

| Spinal Deformities in Cerebral Palsy | |
|--|----------|
| No Spinal Deformity | 81 (81%) |
| Scoliosis | 1 (1%) |
| Lumber lordosis | 17 (17%) |
| Both | 1(1%) |
| Total | 100 |
| Oral Musculature Problem in Cerebral Palsy | |
| Having no Problem | 25 (25%) |
| Drooling | 39 (39%) |
| Swallowing Difficulty | 7(7%) |
| Both | 29 (29%) |
| Total | 100 |
| Contractures in Cerebral Palsy | |
| Contracture of elbow flexor | 22% |
| Contracture of knee hip adductors | 26% |
| Contracture of knee flexor | 20% |
| Contracture of flexor of hip | 20% |
| Most Common Deformities in Cerebral Palsy | |
| Wrist drop/wrist flexion deformity | 37% |
| Elbow flexion deformity | 21% |
| Finger felxion deformity | 10% |

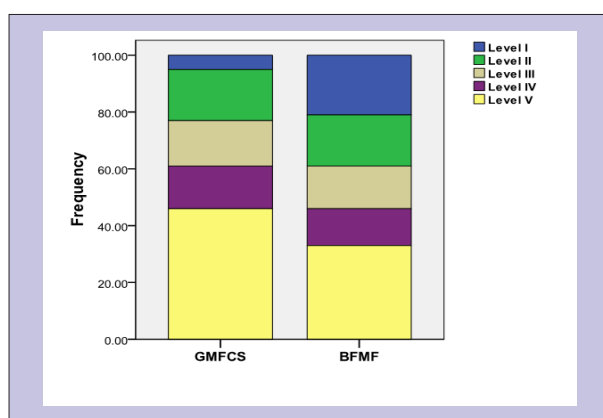


Fig-1: Frequency of GMFCS and BFM levels in CP Pts

Table-3: Relationship of GMFCS levels with classification of cerebral palsy and topographical classification of cerebral palsy.

| GMFCS Levels | Classification of CP based on movement impairment | | | | P-value |
|--------------|---|----------|--------|-------|---------|
| | Spastic | Athetoid | Ataxic | Mixed | |
| Level I | 3 | 1 | 1 | 0 | |
| Level II | 12 | 2 | 4 | 0 | |
| Level III | 12 | 3 | 1 | 0 | 0.038 |
| Level IV | 12 | 1 | 2 | 0 | |
| Level V | 40 | 1 | 0 | 5 | |
| Total | 79 | 8 | 8 | 5 | |

| | Topographical Classification Of Cerebral Palsy | | | | P-value |
|-----------|--|----------|--------------|------------|---------|
| | Hemiplegic | Diplegic | Quadriplegic | Monoplegic | |
| Level I | 0 | 0 | 3 | 1 | |
| Level II | 6 | 1 | 5 | 0 | |
| Level III | 5 | 2 | 3 | 2 | 0.000 |
| Level IV | 0 | 3 | 8 | 1 | |
| Level V | 0 | 4 | 36 | 0 | |
| Total | 11 | 10 | 54 | 5 | |

Table-4: Relationship of BFMF levels with classification of cerebral palsy and topographical classification of cerebral palsy.

| GMFCS Levels | Classification of CP based on movement impairment | | | | P-value |
|--------------|---|----------|--------|-------|---------|
| | Spastic | Athetoid | Ataxic | Mixed | |
| Level I | 10 | 1 | 6 | 2 | |
| Level II | 15 | 2 | 1 | 0 | |
| Level III | 13 | 3 | 1 | 0 | 0.009 |
| Level IV | 10 | 1 | 0 | 2 | |
| Level V | 31 | 1 | 0 | 1 | |
| Total | 79 | 8 | 8 | 5 | |

| | Topographical Classification Of Cerebral Palsy | | | | P-value |
|-----------|--|----------|--------------|------------|---------|
| | Hemiplegic | Diplegic | Quadriplegic | Monoplegic | |
| Level I | 0 | 3 | 5 | 2 | |
| Level II | 5 | 5 | 3 | 2 | |
| Level III | 6 | 2 | 5 | 0 | 0.000 |
| Level IV | 0 | 0 | 10 | 0 | |
| Level V | 0 | 0 | 31 | 0 | |
| Total | 11 | 10 | 54 | 4 | |

Discussion

In the present study, GMFCS and BFMF classification levels were documented in 100 CP children. Higher frequency of spastic quadriplegic CP had worst motor functional impairments based on GMFCS & BFMF Levels. These results are closely

related to another study which stated that the classification of CP should be based on CP type and motor function, as the two combine to produce an indicator of total impairment load.⁸

The present study in contrast with another study conducted in which the distribution by Gross Motor

Function Classification System (GMFCS) level was: Level I, 50.6%; Level II, 18.2%; Level III, 9.3%; Level IV, 9.7%; Level V, 12.1%. The most common topographical classification was spastic diplegia (38.5%), followed by spastic hemiplegia (34.8%) and spastic quadriplegia (14.6%). Significant difference was that quadriplegic CP was most common spastic type of CP in the present study.⁹

This study reveals that quadriplegic CP was the most frequent type that had worst motor impairment using GMFCS and BFMF levels. Same results were found in another study which states that spastic CP was most common type (80.5%), more specifically bilateral CP (62.5%) was more common than unilateral CP (18%) with respect to Manual Ability Classification System (MACS) and GMFCS levels it was concluded that bilateral spastic CP was the most frequent type that had the worst motor impairment.¹⁰

In present study, among oral musculature problems, drooling was found to be the most common problem and it was most common in the spastic type of quadriplegic CP. Among spinal deformities, lumber lordosis was found to be highest in

frequency. Other deformities were also found to be present mostly among Spastic CP more specifically in quadriplegic CP. Contracture of elbow flexor, hip adductors, knee flexor and flexor of hip were also frequent in spastic type of quadriplegic CP in children.

Conclusion

In our series of paediatrics patients with CP, most of the patients were spastic (79 of 100). Frequency of male patient affected with CP was higher than female patients. More severe GMFCS and BFMF levels correlated with larger proportions of accompanying fine and gross motor impairment. Fine and gross motor functional impairments were more frequently associated with spastic type of CP, more specifically quadriplegic spastic type of CP as compared to any other type of CP with respect to the GMFCS and BFMF Scales.

*Depp't. of Developmental & Behavioural Paediatrics,
The Children's Hospital and Institute of Child Health,
Lahore*

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