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Case Report

Applicability of Peabody Developmental Motor Scales-2 in Spastic Diplegia: A Single Case Study

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ABSTRACT

Introduction: In India, cerebral palsy is 3 per 1000 live births. Spastic diplegia accounts for 57%. The prognosis of spastic diplegia is assessed by perambulatory milestones. Motor activities can be assessed by various evaluating tools. Peabody developmental motor scale-2 (PDMS-2) has not been widely used in India; hence single case study has been taken to study its applicability in evaluating motor development in spastic diplegic children.
Materials and Methods: Subjective evaluation using routine assessment was done of a child 'D' and physical therapy intervention was implemented. He was evaluated at 31 and 52 months of chronological age on PDMS-2, using guide to item administration and examiner's manual. Physical therapy interventions depend upon goal attainment as per decision of the physical therapist.
Results: On evaluation on PDMS-2, he was found to be an average, below average and poor which states that, PDMS -2 detects motor developmental delay and shows changes as per development.
Conclusion: PDMS-2 can be used as an evaluation tool in children with spastic cerebral palsy. According to this study it is recommended that there is need to study large number of population with motor developmental delay for the confirmation.

Key words: PDMS-2, Spastic diplegia, 5 years follow up.

INTRODUCTION

Cerebral palsy is a developmental disability first described in 1840's by William Little. It can also be termed as static encephalopathy as the primary lesion is static, however due to growth and developmental plasticity and maturation of central nervous system the clinical pattern of presentation may change in due time. Cerebral palsy is primarily a disorder of movement and posture as an "umbrella term covering a group of non progressive, but often changing, motor impairment syndromes secondary to lesions or anomalies of the brain arising in the early stages of its development". [1] The motor disorders of cerebral palsy are often accompanied by disturbances of sensations, perceptions, cognition, communication, behaviour, epilepsy and secondary musculoskeletal problems. [2]

A population based estimate of CP prevalence among eight year old children in three sites in the united states in 2004 was 3.3 per 1,000(95% confidence interval, 2.9-3.8). Significantly higher prevalence was seen in boys than in girls. (Male/female ratio, 1.4:1). Out of 3 sites most common subtype was spastic CP, ranging from 85% in Georgia to 89% in Alabama and Wisconsin. [3] In India; prevalence of CP is estimated over 25lakh individuals, where as incidence is up to 3 cases per 1,000 live births. Spastic diplegia was found in 202 out of 480 cases (54%) in a study done at Jaipur. [4]

Cerebral palsy can be classified into various forms but now a day's GMFCS is the most widely used for epidemiologic surveillance. [5] In severe spastic diplegia there is disuse atrophy and impaired growth of lower limb and disproportionate growth with normal development of upper torso, 20-25% present with seizers; prognosis is excellent for normal intellectual development. [6,7] Nordmark et al estimated good prognosis of spastic diplegic patients, where 167 patients with CP were studied, in which 61% of patients with diplegia ambulated independently.

The ambulation charts estimate the probability of CP child who is non ambulatory at 2 to 3 and ½ year of age whether they will walk with or without support. [8] Motor delay can be assessed by various scales which are normed on western population like BSID, revised BSID, Battelle developmental inventory. [9] Baroda developmental screening test, [10] Trivandrum developmental screen chart are based on the Indian norms. [11] PDMS-2 is normed on western population. It has good test retest reliability and interclass correlation coefficient = 0.88-1.00. The sensitivity to change coefficient ranged from 1.6 to 2.1, responsiveness coefficient ranged from 1.7-2.3. [12] Its applicability in Indian scenario is studied (Mangalore, [13] Dharwad [14]) on normal children and raised questions regarding cultural variability. [14] However applicability in children with spastic diplegic cerebral palsy was not studied. A single case study is considered for PDMS-2 applicability and also descriptive discussion done on changes secondary physical therapy in spastic diplegic child.

CASE STUDY: 'D'

Case 'D' came to us with diagnosis of spastic diaplegia at chronological age of 9 months. He had a history of preterm vaginal delivery in hospital with vertex presentation, immediate birth cry, birth weight of 2kg, 5 days of NICU stay, history of mild seizures and for few days was on medication with no history of seizures in later life. The chief complaints were unable to sit in transitional pattern and had toe walking when made to walk. On evaluation tone: hypertonia in bilateral lower limbs (Modified Ashworth Scale-1), Reflexes: atypical presentation of palmar grasp was present. Passive range of motion of all four extremities was full and free.

After Evaluation: Referred to speech & language therapist. Advised to undergo checkup under pediatrician and neuro-pediatrician and advised to come on regular basis for physiotherapy. Based on impairment list, mini and short term goals were planned. Child was on therapy for an average of 4 to 5 days per week almost up to 18 months. Improvement noted: 1) Independent sitting achieved at 14months 2) Pull to stand achieved at 18months. But child discontinued the therapy (Reasons unknown).

'D' visited again at 27month where he had all achieved status as earlier. He was assessed on PDMS-2 on 31st month.

Problem list at 31month was- Running on toes, reciprocation of hands was absent.

Table1: Shows interpretation of PDMS-2 Subtest Standard Scores and relation of various standard scores to percentile ranks.

Components & Raw Score 31/52 months	Age equivalent		Percentile		Standard Scores		Description		Z Value	
	31 Month	52 Month	31 Month	52 Month	31 Month	52 Month	31 Month	52 Month	31 Month	52 Month
Stationary 38/47	18	43	25	16	8	7	Average	Below Average	-0.67	-1
Locomotion 128/112	32	25	50	2	10	4	Average	Poor	0.00	-2
Object Manipulation 14/37	20	44	9	25	6	8	Below Average	Average	-1.33	-0.67
Grasping 42/47	20	43	37	16	9	7	Average	Below Average	-0.33	-1
Visual motor integration 86/107	20	31	5	5	5	5	Poor	Poor	-1.67	-1.67

Table 2: Shows quotient the percentiles.

	GMQ		FMQ		TMQ	
	31 Month	52 Month	31 Month	52 Month	31 Month	52 Month
QUOTIENT	87 (Below Average)	76 (Poor)	82 (Below Average)	76 (Poor)	83 (Below Average)	74 (Poor)
PERCENTILE	19	5	16	5	13	4

(GMQ: Gross motor quotient, FMQ: Fine motor quotient, TMQ: Total motor quotient)

Based on PDMS-2 [15] evaluation and impairment list, motor activity program was designed. By the end of 46 months he started walking comfortably approximately 50 meters without high guard posture.

During 31st to 51st month 'D' was coming once or twice for the therapy/ week in spite of counseling on his improvement and explaining the importance of therapy to the parents. 'D' started going to normal school and came to us at 51 months with difficulty regarding academics like, handwriting, play activity, difficulty in coping within peer group. He was evaluated on PDMS-2 on 52 months.

DISCUSSION

'D' who had a history of premature birth and low weight came to us with a diagnosis of spastic diplegia. The clinical features were spastic cerebral palsy is under physiological classification which is represented as early hypotonia followed by spasticity, commando crawl-if spasticity is severe, on examination this revealed, spasticity in lower extremities (adductors, gastrocnemius, hip flexors), brisk reflexes, ankle clonus and bilateral babinski sign, contracture associated with spasticity, scissoring posture of lower extremity when made stand, walking is significantly delayed and the child held his feet in equinovarus as he walked on his tip toes. According to the problem list which was addressed, therapy was planned. Initially child was regular for the therapy and regularity for therapy was later disrupted. He started walking without high guard posture at 46 months this might be because of intensive therapy and implementation of physical rehabilitation at the earliest. The rehabilitation for longer duration may be possible because of idiosyncratic set up for therapy and use of available resources. This was supported by study conducted in the year 2004 in Japan, for spastic diaplegic children, who received different intensities of early onset physiotherapy for 5 years follow up. [16] Our results were also supported by another single case study of ambulatory 3 and half year old female diagnosed at birth with spastic diplegic CP with premature birth at 28 weeks of gestation, weighing 1 pound, 14 ounces positive history of NICU stay and treated for infantile seizures, was given intensive model of therapy with incorporation of treatment methods, encouraging proper alignment and giving

dynamic proprioceptive input. The 62 months follow up showed those who completed training, able to do pull to stand by 17 months and walk near normal by 50 months and this result were in agreement with our study. [17]

CONCLUSION

From this case study, we concluded that,

1. PDMS- 2 helps to diagnose motor developmental delay.
2. Early interventions help.
3. Impairment based biomechanically analyzed treatment protocol gives good results.
4. As age progresses growth plays a key role, accordingly therapy needs to be planned by therapist.
5. Larger longitudinal study can be carried out to prove about conclusion statistically.

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Conflicts of Interest: None

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