ORIGINAL ARTICLE

Effect of Portage Early Education Program on The Neurodevelopment of Children with Cerebral Palsy

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ABSTRACT

Objective: To determine the effect of portage early education program (PEEP) on the neurodevelopment of cerebral palsy children.

Study Design: The Quasi-experimental- pre and post design

Place and Duration of Study: Developmental pediatrics department, the children hospital, and the institute of child health Multan from 1st January 2020 to 24 December 2020.

Materials and Methods: We enrolled 58 children of 2 to 10 years of age, both gender, diagnosed as spastic cerebral palsy for this study. All the children were assessed pre- and post-program using PEEP and GMFM (Gross Motor Function Measure) twice 6 months apart. They were advised regular weekly PEEP based therapeutic Sessions at hospital by multidisciplinary team, and continuation of these therapies at home. Data was analyzed by using SSPS version 16. The mean difference in the scores of the developmental levels, initial and after 6months was compared by using paired t test.

Results: Out of 58 study subjects, male were prominent; 42(72.41%). Most of the participants had quadriplegia type of spastic Cerebral Palsy 26(44.83%), with gross motor function level 5, [24(42.86%)]. The mean comparison of Developmental Quotient of children calculated at initial stage and after six months in areas of gross motor, cognition, self-help, socialization, and gross motor function measure was found statistically significant(p-value<0.001)

Conclusion: Children with Cerebral palsy are associated with delayed development in certain developmental domains other than involvement of motor and posture. PEEP is an effective tool for improvement in Development of CP children

Key Words: *Cerebral Palsy, Portage Early Education Program, Spastic Quadriplegia.*

Introduction

CP is a broad term which is defined internationally as follows:

"Cerebral palsy describes a group of permanent disorders of the development of movement and posture, causing activity limitation that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain." [1] CP has prevalence of 1.5–5.6 cases per 1000 live births. CP is classified by Geographical classification, Physiological classification, and Gross Motor Function Classification System (GMFC system).[2] Diagnosis is mostly clinical. Important etiology includes Brain injury or abnormal brain development, pre and post maturity, Cerebral leukomalacia, periventricular–intraventricular hemorrhage, hypo perfusion injuries and Cerebral infections or inflammations[2,3], Although, the brain damage is not progressing, but its manifestations keep on changing with development of child, resulting in limited participations in the different life areas and activities.[4] Similarly CP is a motor disorder but it has associated problems of sensation, perception, cognition, communication and behavior, musculoskeletal problems and epilepsy [1] which manifest as complications like intellectual or learning disability (40%); epilepsy (30%); movement disorders (20%); visual impairment (16%); malnutrition, gastro esophageal reflux, obesity, hydrocephalus (14%) and developmental problems. These problems must be managed by involving multidisciplinary team.[2,5] Early intervention results in the better outcome of the patient symptoms.

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Treatment modalities includes physiotherapy, occupational therapy, psychotherapy, speech and developmental therapy and inclusive education for these children. The portage early education program (PEEP) began in Great Britain and is now practiced worldwide for developmentally delayed children. It is based on the idea that genetic and environmental factors have a great role in the development of the brain, in both functional and structural aspects.[6] The brain plasticity is more during early life. During this period, the environmental factors also strengthened adaptive and compensatory skills[6] therefore intervention started in infantile period reveals better results.[7] It emphasize the importance of hospital based and home therapy by parents for improvement of the children with delayed developmental. There is a critical role of timely intervention for the better outcome of children with special needs. PEEP includes therapeutic tasks for almost all developmental domains. It not only involves individualized intervention but emphasize great importance to the parental role as a therapist. Because better results are achieved with parental participation and execution.[8]

Although studies about Intervention in Global developmental delay and Autism are present in literature but Studies on the outcomes of children with CP are surprisingly few[7] in the present study, we applied the PEEP to children with CP and observed effect of PEEP on the neurodevelopment of cerebral palsy children.

Materials and Methods

This Quasi-experimental- pre and post design was carried out in outpatient department (OPD) of Developmental and behavioral pediatrics of CH&ICH Multan. We enrolled 58 children presented with delayed development, abnormal muscle tone, and hyperreflexia, clinically diagnosed as CP[1, 2], ages between 2 to 10 years, both gender from January 2020 to December 2020 by convenient sampling. The children having Degenerative brain disorders, Myopathies, Neuropathies, Inborn error of Metabolism, chromosomal abnormalities, severe hearing deficit, and did not gave consent, were excluded. These disorders were diagnosed on clinical features, examination findings and available investigations. Sample Size was calculated through STATA 15, using paired t-test for correlated means.[9]

Procedure of the study was told to the Parents/guardian after taking written consent. For all CP children detailed history was taken from parents/guardian. Their socioeconomical status was noted. Complete neurological examination was done in all children. Type of CP was determined. PEEP and GMFM (Gross Motor Function Measure) was used to assess developmental levels in all domains and functional severity of motor function respectively. A trained and expert clinical psychologist with more than 10 years of experience working with PEEP, administered and assessed every child for his/her interests, deficit and learning capacities, in a quiet room with peaceful surroundings. Portage has five development key areas along with infant stimulation, applied up to 6 years of mental age. These are gross motor (GM), cognition(C), self-help (SH), socialization(S) language (L). Each area had a specific checklist according to age. Total number of items are motor: 140, Cognition: 108, Self-help: 105, Socialization: 83 and language: 218 and infant stimulation: 45. All patients were assessed according to checklist items. When there were 10 consecutive negative items, at that point of checklist stops. Positive items were obtained by subtracting failure items from total. Developmental age was assessed by first subtracting failures from total to calculate positive items (Total – failure = positive items). Then the positive items were divided by total items and then multiplied by 12 to find out developmental age (Development age=positive item/total item × 12). Developmental age is used to access his/her developmental quotient in all areas by: DQ=DA/Chronological age × 100). She assessed the mental age in all 5 domains and individualized training programs (IEPs) were developed according to each child's development levels and needs. Sessions were started to overcome deficits by Psychologist, speech therapist, occupational and physiotherapist. The sessions / training program was performed on every visit on weakly basis in the department for at least half hour, during which parents were also trained. Parents were advised to spend at least 2 hours per day for continuation of these therapies/activities at home. After 6 months the resulting effects were Re-evaluated by assessing PEEP and GMFM.

Approval was taken from the institutional ethical

committee. No conflict of interest was involved in this study. No financial support was provided by the institution or pharmaceutical company.

All the data was entered on preformed Performa. Statistical analysis was done by using SSPS version 16. The mean difference in the scores of the developmental levels/quotients, initial and after 6monthsof therapy was compared by using paired t test. $P < .05$ was considered statistically significant and 95% confidence interval was used.

Results

Out of 58 patients 42(72.41%) were male with male to female ratio of 3:1. Most of the children 28(48.29%) were age group >4-7years (Table I). Mostly Children were diagnosed having spastic quadriplegic type 26(44.83%) with level 5 GMFM 24(42.86) (Table II). DQ of CP Children in areas of GM, C, SH, S, L and GMFM was found statistically significant with therapy (Table III).

Table I: Basic Characteristics of Participant (n=58)

Characteristics		N (%)
Gender	Male	42(72.41)
	Female	16(27.59)
Age group distribution		(29.17±19.21)
2-4years		14(24.14
>4-7years		28(48.29)
>7-10years		16(2.59)
Socioeconomic Status	Poor	36(62.06)
	Average	04(6.90)
	Middle1	8(31.03)

Table II: Type of CP & GMFM (n=58)

Type of CP	Spastic Quadriplegic	26(44.83%)
	Spastic Diplegic	17(29.13)
	Spastic Rt Hemiplegic	10(17.24)
	Spastic Lf Hemiplegic	05(8.6)
GMFM Level	Level II	08(13.79)
	Level III	11(18.96)
	Level IV	15(25.86)
	Level V	24(42.86)

Discussions

In this study DQ of CP Children in areas of GM, C, SH, S, L and GMFM was found statistically significant with therapy (Table III).

The current hospital-based research showed that most children were male, age group >4-7years, of spastic quadriplegic type 2, with level 5 GMFM. All the recruited CP children have delayed development in all developmental domains (GM, SH, C, S, L), these were assessed and trained using PEEP, which is an effective tool for the treatment of CP for neurodevelopmental rehabilitation. Portage guide is a perfect checklist for assessment and training in structured settings. Due to its, interesting, scientific, logical, and easy applicable nature, it has been used worldwide for early intervention for the development and training of CP children .[7] Our children showed good improvement after 6 months of therapy weakly at hospital by multidisciplinary team and home by parents/family member on daily basis.

Table III: Comparison of Developmental Profile Between Children Initial and after six months of PEEP Therapy

Variables	Initial (n=58)	After six months (n=58)	P-value
Gross motor	22.61±3.87	28.86±4.94	<0.01
Cognition	19.30±3.31	29.93±5.13	<0.01
Self-help	18.77±3.21	29.12±4.99	<0.01
Socialization	23.35±4.0	29.12±4.99	<0.01
Language	22.28±3.82	28.64±4.91	<0.01
GMFM levels	0.62±0.10	0.93±0.16	<0.01

These findings were similar to others as, Sorensen, Kristian described the better outcome of cerebral palsy with regular intervention in longitudinal study conducted in Norway.[10] A study carried in china where they rehabilitated the children with Global developmental delay including cerebral palsy using PEEP for 6 months period, They found marked improvement in development of the children with regular developmental, occupational and physiotherapy and they found PEEP an effective tool.[9] A study was planned in Lebanon for rehabilitation of children with special needs, which also favored the importance of regular therapy and described portage as an effective tool for home therapy.[11] this favors of our results. Sharon Barak also described the improvement in functional independence of CP children with regular therapy.[12]

Similar results were obtained by Iona Novak in systematic review of intervention of CP children and adults.[13] early intervention services and follow up

program results in the better outcome of CP children, indicated by Ekaterina in Moldeve.[14]

A study done in National Institute of Rehabilitation Medicine (NIRM) Islamabad described that early and regular physiotherapy results in improvement in GM functions in CP[15].Verschuren in Netherland also found physiotherapy as effective in gross motor outcome of the CP children[16], while Heilkam et al described no significant improvement in infant outcome with only physiotherapy intervention, but family quality of life improved.[17]

We found predominantly male child with age range 4-7years and poor socioeconomic status, these findings are like another one.[11]

Limitations of this study includes that National data showing PEEP intervention in CP is very less. The current study is of limited time duration. Although our result showed positive effects with only 6 months of PEEP implementation, further research is needed to prove the long-lasting effects with continuation of intervention for longer duration. Results must be compared to control group.

Conclusion

PEEP is an excellent effective interventional system for neurodevelopment of CP children with delayed development, which covers therapy in all developmental areas for a long time for better outcome.

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CONFLICT OF INTEREST

Authors declared no conflicts of Interest.

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DATA SHARING STATMENT

The data that support the findings of this study are available from the corresponding author upon request.