THE EFFECT OF BASIC PHYSIOTHERAPY INTERVENTIONS ALONG WITH BOBATH TECHNIQUE IN CHILDREN WITH NEURO DEVELOPMENTAL DELAY

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ABSTRACT

Background:

Neuro developmental delay is characterized by the significant arrest of child's developmental process in one or more developmental domains. The various forms of neurodevelopmental delay include Global developmental delay, Specific developmental delay, Transient developmental delay and persistent developmental delay. The causes include congenital abnormality, heredity, childhood infection or trauma and birth asphyxia. The problem is managed by multidisciplinary team consisting of physiotherapist, occupational therapist, orthotist, physician, neurologist, pediatrician, psychologist, special education teacher and speech therapist. Physiotherapy management may include any of or combination of basic physiotherapy interventions, constraint- induced therapy, motor relearning program, Bobath technique, trans-disciplinary rehabilitation approach.

Objective:

Objective behind this study was to determine the effectiveness of Bobath technique along with basic physiotherapy interventions in children with neurodevelopmental delay.

Methodology:

It was Cohort study with non probability convenient sampling technique. The hypothesis was tested by applying **Chi-square test.**

Results:

Bobath technique along with Basic physiotherapy intervention is not statistically more effective in optimizing the functional level of children with neurodevelopmental delay than basic physiotherapy interventions alone.

Conclusion:

It was concluded that application of Bobath technique along with Basic physiotherapy interventions was no more effective than Basic physiotherapy interventions alone when Functional Independence Measurement Scale was used to measure the outcome. The prognosis was better among most patients after applying both Bobath technique and Basic physiotherapy interventions. Prognosis was still good in patients who received Basic physiotherapy interventions alone.

KEY WORDS

Bobath Technique, Neurodevelopmental Therapy, Hands on Facilitation

1. Introduction

The condition in which a child significantly lags behind in one or more than one areas of developmental stages is called neurodevelopmental delay. The limitation is believed to occur between birth and adolescence during human developmental period. [(1)] Neurodevelopmental Delay is characterized by

- Poor Gross or/and Fine motor skills
- Language or/and Speech Deficit
- Social and Behavioral Problems
- Poor Intellectual Skills
- Problems in Self-care [(1,3)]

Specific developmental delay refers to deficit in one area while Gross developmental delay is omission or arrest in two or more developmental stages. There are many different causes of Neurodevelopmental Delay. These include genetic abnormalities, infection, perinatal complications, drugs and some neurological or non-neurological defects. [(32)]

Physiotherapy Treatment has been found to be very effective in minimizing many problems associated with Neurodevelopmental Delay. According to Nancy E. Mayo the treatment which includes neurodevelopmental therapy along with basic physical therapy interventions of using primitive reflexes and goal-directed exercises help the children in achieving motor and adaptive skills and optimizing their functional level. [9, 11]

Developmental delay can be categorized on the basis of development over time. Transient developmental delay is lag in any developmental stage for short period of time,
after which the child may catch up the normal developmental process. This type of delay may be due to some chronic illness, poor nutrition or lack of environmental stimulation. The other type has been described as Persistent developmental delay. This type refers to persistent inability to achieve developmental milestones. [37, 13, 19]

An individual with Disabilities Education Act (IDEA) 2000 of commonwealth of Virginia defines developmental delay as:

1. Children who are functioning at least 25% below their chronological or adjusted age, in one or more of the following areas:

A. cognitive development;

B. physical development (including fine motor, gross motor, vision, and hearing);

C. communication development;

D. social or emotional development;

E. adaptive development

(34 CFR 303-16 (a) (1)) [28, 42-43]

There are many underlying problems which can cause permanent developmental delay. For example cerebral palsy, epilepsy, intellectual disability or autistic disorders may result in permanent visual, hearing and speech loss. Other presentations include movement disorders, poor coordination and balance and behavioral problems. High risk factors include birth trauma, alcoholic intake by mother or exposure of mother to toxins, such as lead, during pregnancy, birth asphyxia, cerebral infections of neonate, traumatic insult to the developing brain, perinatal infections such as Rubella, HIV, cytomegalovirus etc. Less frequent causes include poverty,

absence of environmental stimulants, poor diet and improper care or supervision of the child. [20, 22-25]

2. Physiotherapy management:

There is no drug therapy that may help to regenerate or unmask the underdeveloped or abnormally developed nervous pathways. So children with developmental delay need the lifelong services of rehabilitation team.

a) Basic physical therapy interventions: Physiotherapy management embraces many types of approaches. These interventions emphasize on the development of sensory awareness of different movements by positioning the child in weight bearing position and establishing the postural control. other components of basic physical therapy interventions are respiratory care (diaphragmatic breathing exercises, respiratory resistance training, chest mobility exercises and postural drainage) , use of orthoses like knee-ankle-foot orthoses, resting or dynamic hand splints, and assistive devices, passive or active assistive range of motion exercises, joint mobilization, soft tissue mobilization, stretching the spastic muscle groups, strengthening weak muscles, prone lying on a wedge, standing on a tilt table, gait training in parallel bars, balance training on a rocker or balance board, electrotherapy, hydrotherapy, walk on a treadmill with or without weight support and attainment of developmental milestones through the use of primitive reflexes. [26, 32, 38-41]

Bobath technique: Bobath approach gives amazing results in rehabilitation of children with developmental delay, when applied in conjunction with basic physiotherapy interventions. Bobath technique focuses on regeneration or stimulation of undeveloped nervous pathways through the mechanism of hands-on facilitation on proximal and distal parts of patient's body. Other approaches are trans-disciplinary, motor relearning and PNF techniques. [27]

It was originally devised by Karel Bobath and Berta Bobath in the late 1940s. The concept is known as neurodevelopmental therapy in some parts of North America. The physical therapy program is incorporated in daily activities of children with developmental delay. It is a problem solving approach that helps to optimize the functional level of children with developmental delay and enables them to catch up the normal developmental process. Human brain has the ability to change its structure, function and chemistry when specific stimulations

are applied. This is called plasticity of nervous system. So if stimulation that influences the developmental process of brain is known to physical therapist, then concept of neuroplasticity can be used to hasten the process of development of the child with mental illness or developmental delay (DD). (11)

Children with disorder of motor function usually have impaired sensory and vestibular system. The child may have low sensations of noxious or any other stimulus, balance and coordination problems and history of repetitive falls and unidentified bone fractures. Application of specific sensory and vestibular stimulation helps the patient to achieve the motor function. In the same way, the fine motor skills can be improved by providing specific tactile stimulations. Similarly developmentally delayed children having the articulation or speech problem often have low muscle tone of oropharyngeal muscles or decreased tongue movements. The use of tactile stimulation to mouth and tongue aids to normalize the articulation ability before applying specific interventions of speech therapy. (10)

Tapping or intermittent compression is applied on patient's proximal or distal key points to provide sensory or tactile stimulation and thus the motor activity is "facilitated". Sensory pathways are inhibited due to upper motor neuron lesion. The child learns the postural stability, equilibrium and defensive reactions of reach or grasp and release when "Hands on facilitation" is provided by physiotherapist at the key points of patient's body. Bobath approach is based on the concept that "sensations of movement pattern are learned not the movements themselves." (11)

Neurodevelopmental therapy (NDT) or Bobath concept can be described as "talk to the nervous system in a language that it understands". It involves the use of interventions that are devised to address the patient's impairments and functional limitations. Spasticity in developmentally delayed children can be reduced by using reflex inhibiting postures (RIPs) designed on the basis of Bobath concept. The structural organization of pre and post synaptic transmission changes according to both intrinsic factors and environmental experiences. (21)

Duration: The duration of treatment session ranges from as low as ten minutes to one and half hour and is given on alternate days or 2 days per week depending on the patient's special needs and functional limitations. The treatment program is designed after careful assessment of

the patient and is planned to meet the functional goals set by patient and the therapist. The average duration of one treatment session is usually forty five minutes and frequency is kept at the three sessions per week.(12)

Treatment Plan from 1-3 months: Patient's specific treatment approach entails sensory and proprioceptive facilitation to stimulate the masked or degenerated nervous pathways to gain postural stability and control. Berta Bobath summarized the concept as "give life not exercise". Graded sequence (neck holding, rolling, sitting, quadruped, kneeling and standing) of motor activity is combined with the exercise program to achieve the missing or delayed developmental milestone. Spastic limbs are placed in reflex inhibitory postures to reduce the tone. The exercises are designed to achieve the functional goals of the patient. (8)

Reflex inhibitory postures are used to inhibit abnormal tone and irregular movement patterns. Undeveloped or masked motor activity is achieved by sensory facilitation of correct or normal movement patterns in a developmental sequence. Normal sequence or hierarchy of developmental milestones is gained by "postural sets" or preparatory postural reactions (PPRs) which help the child to attain normal process of development. (29)

Child is gradually progressed from supine to side lying, propping up on elbow then on forearms, kneeling and finally in standing to gain gross motor control in developmental sequence using Bobath approach. Persistence of Moro reflex and asymetric tonic neck reflex establishes abnormal movement patterns which are supressed by treatment with neurodevelopmental therapy at the corrected age of two to three months.(31)

Treatment Plan from 3-6 months: The treatment is a close interplay of patient, therapist and environment to perform a functional goal-riented task. Child actively moves into normal movement patterns while therapist inhibits or controls abnormal ones. The normal movement patterns are repeated many times in order to reinforce and establish them. The activities are changed gradually so that child experiences many movement patterns in many different ways that is it is "repitition without repitition". (36)

Treatment interventions are incorporated into daily activities of child with active cooperation from parents and teachers. Bobath therapist works in close collaboration with occupational, speech therapist, psychologist, neurophysician, pediatrician and orthopedic surgeon to look after

all the problems of children with developmental delay. The interventions are tested through continuous assessment and reassessment of child at specific intervals. Exercise plan is modified according to the patient's response to interventions. Child is more responsive to the treament till the age of one and half year. The techniques of stretching the tight muscles, weight bearing on limbs and eliciting contraction in flaccid mucles by stretch reflex are utilized in Bobath therapy program to treat the developmentally delayed children. The aim of therapy is to achieve the automaticity of equilibrium and rightning reactions, postural stability and movement control to normalize the tone through the cocontraction of muscles and not the strengthening or stretching of muscle groups. [2,6]

When the ability to perform the missing component (for example, ability to control his head in prone) of a developmental milestone (sitting) is attained, the child is moved on to the next developmental stage (the ability to stand). There is abnormal flexor activity in prone and abnormal extensor activity is associated with supine position in children with developmental delay. These associated reactions interfere with child's ability to hold his neck and roll over. There is no definite technique but the treatment is designed in response to the patient's reactions to the therapist's handling. Thus the Bobath therapy is not only specific to the child's needs but also to the child's response to the interventions. [2-5]

Bobath approach is found to be very effective at all levels of brain functioning and is superior to other neurorehabiltative approaches such as motor relearning programs and constraint-induced movement therapy. Bobath approach designs the interventions that minimize the inappropriate compensatory strategies and enable the child to perform his tasks in changing environments. [17]

3. Materials & Methodology:

It was Cohort study design. All possible subjects who attended the Physiotherapy Outdoor of Children's hospital within 6 months of study were included i.e. 160. Informed consent was taken from the patients or the care givers. The patients were randomly divided into two groups i.e. Group-A and Group-B.

GROUP-A: "EXPERIMENTAL GROUP" included the patients who received treatment with both Basic physical therapy interventions and Bobath technique. GROUP-B: "CONTROLGROUP" included the patients who received only Basic physical therapy interventions. Infants and children with Neurodevelopmental delays (global, transient, persistent or specific), between 3months to twelve years of age and with neurodevelopmental delay due to CVA or head injury, past medical history of infection (meningitis, respiratory infection) and birth history of asphyxia, TORCH infection and congenital abnormality were included. Patients with severe cognitive deficits and those who were not able to follow simple verbal commands were excluded from study.

Pre and post treatment assessment was taken with FIM (functional independence measurement) score. Frequency of treatment sessions was 2 sessions per day, for six days per week. Tools/Indicators Used in FIM Scale were ability to eat, self care, bathing, dressing, sphincter control, transfers, walking or driving the wheelchair and stair climbing, conception, appearance, social communication, dealing with new or challenging situation and memory.

As the study involves human subjects, the ethical clearance was obtained from Children's Hospital and institute of Child Health, Lahore, as per the ethical guideline for Biomedical Research on Human subjects. Follow up was taken by those patients who visited within specific duration of six months. Data was entered and analyzed with the help of SPSS 20.0. Chi-Square test was applied to find out the association between qualitative variables (e.g. FIM Score of Gp A versus Gp B, FIM Score within both groups at entry level, 3 months & 6 months). p-value $\leq$ 0.05 was taken as significant.

5. Statistical Analysis:

Table 1

FIM at entry level * intervention Cross tabulation

		intervention		Total
		Basic PT and Bobath	basic PT	
FIM	1.00	7	6	13

at entry level	2.00	3	4	7
	3.00	28	18	46
	4.00	17	34	51
	5.00	8	5	13
	6.00	5	5	10
	7.00	7	4	11
	8.00	5	4	9
Total		80	80	160

Key: 1.00=complete independence, 2.00=modified independence, 3.00=supervision or setup, 4.00=minimal contact assistance, 5.00=moderate assistance, 6.00=maximum assistance, 7.00=total assistance, 8.00=no activity, Basic PT and Bobath= group, Basic PT only= group B

Table 1.1
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
P Pearson Chi-Square	9.682[a]	7	.207
Lik Likelihood Ratio	9.827	7	.199
N of Valid Cases	160		

Table 1.1 shows FIM score of both groups A and B were statistically insignificant at entry level.

The results of table 1 are also showed by bar chart below:

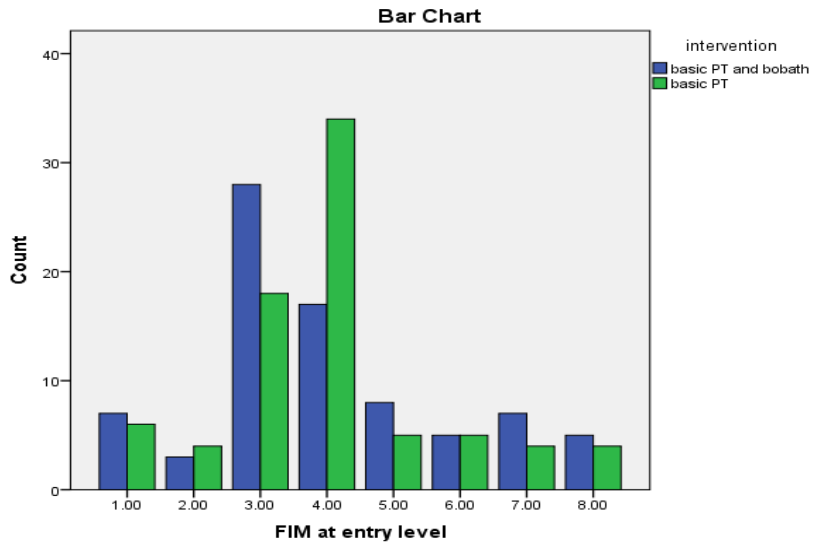


Table 2

FIM upto 3 months * intervention Cross tabulation

Count

		intervention		Total
		Basic PT and Bobath	basic PT	
FIMupto 3 months	1.00	11	8	19
	2.00	4	3	7
	3.00	25	17	42
	4.00	13	23	36
	5.00	14	14	28
	6.00	4	8	12
	7.00	5	4	9
	8.00	4	3	7
Total		80	80	160

Table 2.1
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.505[a]	7	.482
Likelihood Ratio	6.581	7	.474
N N of Valid Cases	160		

Table 2.1 shows that FIM sore results of both groups were statistically insignificant upto 3 months. The results of table 2 are also shown by bar chart below:

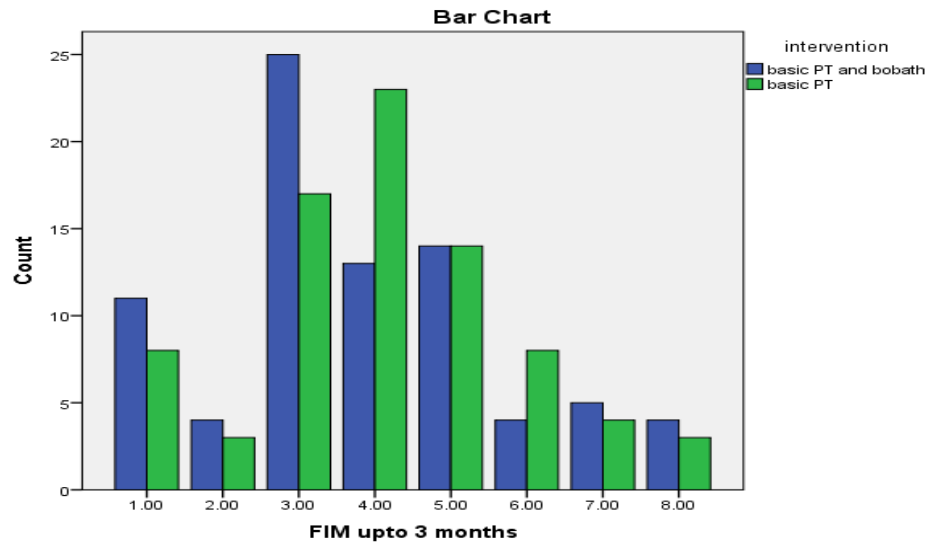


Table 3
FIM upto 6 months *Intervention
Cross tabulation

Count

		intervention		Total
		Basic PT and Bobath	basic PT	
FI FIM upto 6 months	1.00	29	19	48
	2.00	9	7	16
	3.00	10	25	35

	4.00	12	8	20
	5.00	8	4	12
	6.00	6	6	12
	7.00	3	4	7
	8.00	3	7	10
Total		80	80	160

Table 3.1
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.638[a]	7	.081
Likelihood Ratio	12.944	7	.073
N of Valid Cases	160		

The table 3.1 shows that patients belonging to both groups improved significantly at FIM score upto 6 months than FIM score upto 3 months. The results of table 3 are also showed by bar chart below:

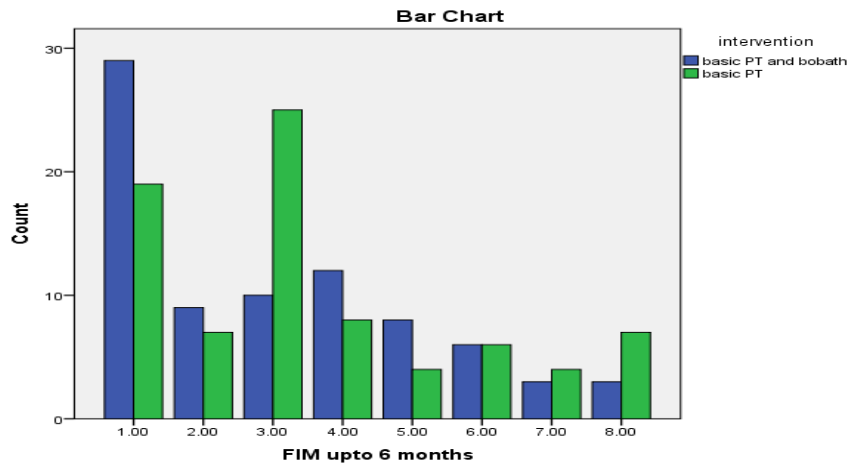


Table 4
prognosis A * prognosis B Cross tabulation

Count

Prognosis A	prognosis B					T
		1	2	3	4	Total
	80	0	0	0	0	80
1.00	0	30	3	16	3	52
2.00	0	0	17	0	3	20
3.00	0	0	5	0	0	5
4.00	0	0	3	0	0	3
Total	80	30	28	16	6	160

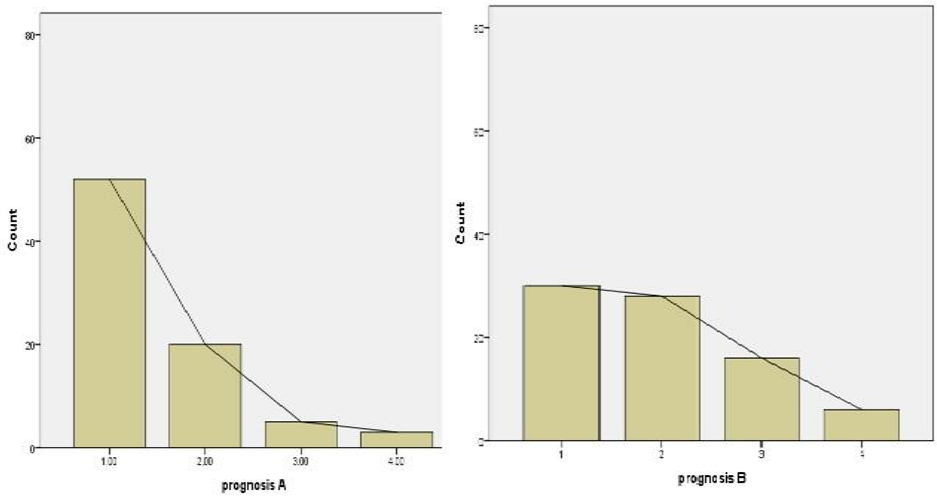
Key: 1=excellent, 2=good, 3=poor, 4=no recovery

Table 4.1

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	287.429[a]	16	.000
Likelihood Ratio	300.172	16	.000
N of Valid Cases	160		

Table 4 represents the comparison of group A prognosis with group B prognosis. There were 52 patients from group A at excellent level of prognosis and 30 were from group B. 20 patients from group A and 28 from group B showed good level of prognosis. 5 patients of group A and 16 patients of group B had poor prognosis. While 3 patients of group A and 6 patients of group B showed no recovery at end of 6 months. Table 4.1 shows that patients of group A had statistically significant level of improvement than the patients of group B at end of 6 months. The results are also shown by the bar charts below.



4. Results:

160 patients with Neurodevelopmental delay were included in the study. 80 patients received basic physiotherapy interventions along with Bobath technique and 80 patients were given basic physiotherapy interventions alone.

The results of this study show that effectiveness of Bobath therapy along with basic physiotherapy interventions compared to basic physiotherapy interventions alone in optimizing the functional capabilities of children with Neurodevelopmental delay was not statistically significant with Pearson Chi-square test value = .081 and degree of freedom= 7, when measured with help of Functional Independence Measurement scale at period of six months.

The Basic physiotherapy interventions when applied in combination with Bobath technique had statistically significant efficient prognosis in children with Neurodevelopmental delay compared to basic physiotherapy intervention alone when measured with the help of Pearson Chi-square test; the value of chi-square test was .000 with degree of freedom 16.

The prognosis of basic physiotherapy intervention without Bobath technique in Neurodevelopmental delay was also good.

5. CONCLUSIONS

Following conclusions are drawn from my study:

- It cannot be stated with a sensible degree of assurance that Bobath therapy along with basic physiotherapy interventions is more effective in optimizing the functional capabilities of children with Neurodevelopmental delay.
- The children with Neurodevelopmental delay receiving treatment program incorporating both basic physiotherapy interventions and Bobath technique showed significantly better prognosis.
- When basic physiotherapy interventions were applied alone, the prognosis was still good.

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