A COMPARATIVE STUDY TO ANALYSE THE EFFECT OF NDT (BOBATH APPROACH) AND BRUNNSTROM APPROACH AND GOAL-DIRECTED IN CEREBRAL PALSY

INTRODUCTION

Cerebral palsy (CP) is a non-progressive neurological disorder that originate in childhood and result from insult to the immature brain that leads to impaired motor function, spasticity and limitation in functional abilities. Rehabilitation is one of the critical approaches to optimisation of quality of life in children with CP. Among a variety of therapeutic approaches currently used, the most well-known are the following: the Neurodevelopmental Treatment (NDT or Bobath approach), the Brunnstrom approach, and the goal-directed approach; all of them have specific goals that focus on the motor function and independence of a client (6-10). Nonetheless, few comparative data have been reported concerning the benefits of these strategies for enhancing the prognosis in C P children and hence identifying the best intercession approach survives ambiguous.

It is the authors' intention to compare the efficacy of the NDT, Brunnstrom approach, and goal-directed therapy on motor function, spasticity, and functional independence ofchildren with spastic CP. In assessing these approaches, the study aims at identifying which of the therapy yields superior results on the motor and functional domains.

The study will use a method of a randomized controlled trial of 90 children with spastic CP aged between 5-12 years. Participants will be randomly assigned to one of three groups: This was achieved by applying the NDT, Brunnstrom approach or goal-directed therapy. Intervention will entail a 12-week therapy in which each group will meet three times a week. Outcome measures will be the Gross Motor Function Measure as an assessment of motor function, the Modified Ashworth Scale for spasticity and the Functional Independence Measure for Children (WeeFIM) to evaluate the children's ability to function independently in daily activities. Furthermore, goal attainment scaling (GAS) will also be employed in the goal directed therapy to evaluate the subject specific treatment gains. Both pre- and post-intervention assessments will be made and data will be analyzed statistically with help of some selected parametric and non-parametric tests.

This study's expected outcome is the identification of different advantages of each therapeutic modality. The NDT group is expected to demonstrate great improvement in motor control and decrease in spasticity while the Brunnstrom approach may benefit from the recovery of movement in the upper and lower extremities specially children with hemiplegic CP. Thus, it is hypothesized that the patients in the goal-directed therapy

group will have greater levels of functional independence and increased participation in daily activities while the individualized approach to the intervention may lead to increased patient and caregiver satisfaction.

By comparing the NDT, Brunnstrom's approach and the goal-directed therapy, this study will give a clear understanding of the most effective treatment in CP. The results would be beneficial to help the clinicians understand each method's merits and drawbacks and enable them to select the logical treatments that would suit particular patients' requirements. Lastly, this study is expected to help in enriching literature on rehabilitation of children with CP and creating a foundation for the design of more suitable interventions with the ultimate goal of enhancing the life experiences of afflicted kids.

This thesis will start with the background of CP, the problem area, and the research objectives which will be majorly aimed at comparing rehabilitation approaches of NDT(Bobath), Brunnstrom, and the goal directed approaches in treating children with CP. The Literature Review will indicate what CP is, what three therapeutic approaches are the most effective, and the findings of other comparative studies. The Methodology will state the research approach, participants' inclusion criteria and exclusion, measures to be employed (GMFM, Modified Ashworth Scale, WeeFIM) and how scores obtained will be analyzed. In the Results section, the study's outcomes of the motor function, percentage of spasticity decrease, and the amount of functional gained independence will be provided according to three groups of patients. The Discussion will make the following details; it will make clinical implications, make details of the findings, explain strength and limitations of the study, and other research implications. The end of the thesis shall consist of the Conclusion section where major findings will be summarized accompanied by the References section, apart from Appendices containing additional information if necessary.

NEED FOR THE STUDY

Despite the availability of several therapeutic interventions including NDT (Bobath approach), Brunnstrom approach, and goal-directed therapy to address child's CP, there are literature gaps with regards to effectiveness of these interventions. Other works, such as those of Marques et al. (6) and Díaz-Arribas et al. (7), have only discussed the Bobath approach in neurorehabilitation but many of the sources are still dealing with the adult stroke patients that do not necessarily involve children with CP. Furthermore, there is moderate evidence that the Bobath approach is not more effective than other procedures for post-stroke rehabilitation (7); nonetheless, the comparison of effectiveness of each of the two for treatment of CP remains limited.

Likewise, a study with regards to Brunnstrom approach has also a positive effect on the motor control of stroke patients (9); thus, such therapy is yet to be properly validated with other therapies, much more in the CP group. While goal directed MCID has been used to augment the functional aspects in children with CP (10) none of these three treatment approaches has been a subject of a large-scale study comparing their effectiveness in the management of CP. This study is therefore important in bridging the above gap, with a comparative analysis that may help clinician make informed decisions regarding the suitable CP rehabilitation strategies. Thus, filling these gaps, this research will supply the relevant valuable information for evidenced based clinically sound decisions that would help to enhance the therapy processes and outcomes for children with CP.

This study has tremendous realistic and clinical relevance as the authors' intentions are to determine the relative efficacy of NT (Bobath Approach), BA, and GDT for the rehabilitation of CP.

Pragmatically, the paper aims at determining which therapy provides the best results in motor function, the volume of which spasticity decreases. Therefore, identifying those techniques that yield the best results can help clinicians optimise rehabilitation interventions required for individuals with CP, thus increasing the effectiveness of interventions, as well as improving utilisation of available resources. This makes provision of therapeutic resources more curtailed and may even lead to cutting down of costs for rehabilitation.

In clinical sensibility, the importance of this study resides in the fact that it can result into enhanced patient outcomes. Thus, deciding on which therapy provides the most improvement, the study will increase patients' utility and self-sufficiency. Moreover, the implications of the findings will be of use towards supporting evidence-based practice to rewrite clinical protocols by more effective rehabilitation interventions for CP. Finally, this research aims at enhancing the methods of practicing therapeutic interventions with the hope of enhancing the quality of care to patients with CP.

AIMS AND OBJECTIVE

AIM OF THE STUDY

A comparative study to analyse the effect of NDT (Bobtah approach) and Brunnstorm approach and goal-directed in cerebral palsy.

OBJECTIVE OF THE STUDY

1. To evaluate and find what kind of goal can be reached after rehabilitation.
2. To evaluate and find what cerebral palsy patient needs.
3. To evaluate and to reduce spasticity & muscle spasm in cerebral palsy rehabilitation.

   Note: NDT, Constraint-induced movement therapy (CIMT).
4. To evaluate and find the effect of neurodevelopment therapy (Bobath approach) and Brunnstorm and Goal-directed approach.

HYPOTHESIS

Alternate Hypothesis: It states that will be significant difference a comparative study between the effect of neurodevelopmental therapy (Bobath approach) and Brusstrom approach and Goal-directed therapy in cerebral palsy.

Null Hypothesis: It states that will be no significant difference a comparative study between the effect of neurodevelopmental therapy (Bobath approach) and Brusstrom approach and Goal-directed therapy in cerebral palsy.

REVIEW OF LITERATURE

CP is a cluster of upper motor neuron disorders which are no progressive in nature and these are results from brain damage or brain structure abnormality which occurs during fetal or early infancy period. Known to alter movement, posture, balance and is, therefore, an important cause of childhood motor disability. It presents in a number of ways; the common ones include spasticity, dyskinesia and ataxia with spasticity being frequent in 50 percent of patients (1). Worldwide, CP is estimated to occur in approximately two to three children per 1,000 live births; and the risk in low-birth-weight infants is almost twice as high (2). Some of the functional limitations seen in children with CP are as follow motor function, cognitive dysfunction and other comorbidities (3). These motor and functional disabilities, therefore, call for early health intervention because of the hardships they because that prolong progression of the diseases.

CP is considered as a category of permanent but non-progressive motor disability involving an individual's movement and posture due to brain problem during its development. CP can be mild to severe in which affected individuals have little or no control over their limbs and require assistance to move around and undertake other essential daily tasks. The cause and nature of CP are varied, and the antecedent factors have been grouped under prenatal, perinatal, and postnatal risk factors (2). It has however been observed that the prevalence rates differ across the global by region with children in the low birth weight or premature categories being more affected, something that underscores the role of perinatal health in minimizing the development of this condition (4).

Therapeutic approaches applied to youngsters prove to be effective in enhancing motor skills in children with CP and thus early therapy intervention is highly important. Early initiation of physiotherapy and occupational therapy can help reduce the extent of motor disability and other immediately related complications such as hip dislocation of muscle contractures (1). Neuroplasticity which is the brain's capacity to alter or remodel its own structure is also is especially viable in CP management. The earlier the interventions are implemented the more they enhance the neuroplastic changes needed for motor aspects and development (5). This supported the need to make an early diagnosis and personalized therapeutic interventions to improve the child with CP's prognosis.

Therapeutic Approaches in CP Management

Bobath Approach or NDT is a common therapeutic technique applied in managing CP. It targets on promoting normal motor coordination and movement and at the same time actively suppressing abnormally functioning Muscle reflexes. The approach involves several forms of handling in order to foster postural support, motor development as well as movement patterning. These include, for instance, choosing a normal verbal intonation, incorporating reflexes, training motor skills through repetitive practice and other specific Learning and teaching approaches (6).

Available literature presents the state of knowledge on the Bobath Approach and the findings point to a mixture of views elicited among the recent research studies conducted concerning this approach. Díaz-Arribas et al. (ref 8: 2020) also performed a systematic review of the Bobath concept for post-stroke rehabilitation in which the authors found no evidence that the Bobath approach was superior to other forms of therapy including forced use, or constraint-induced movement therapy. In the same way, Marques et al. (6) pointed out that although the Bobath concept is still relevant, more research is needed to prove its effectiveness and relevance to clinical practice. This approach has been criticized for not having enough information to support that this technique is superior to other therapies (7). Still, there is some evidence regarding acknowledged benefits of this approach for framed, specialized treatment in developing sensory-motor integration and functional improvements (6).

The Brunnstrom Approach can therefore be described as a rehabilitation technique that is used in the management of stroke and is thus can be used in the management of CP. It stresses that synergies and reflexes have to be included in a sequential motor learning and recovery process. The approach supports the utilisation of existing movement behaviours, including those that are initially atypical, to support further impressive motor abilities. It consists of facilitation of the motor development through various stages from reflex to voluntary muscular movements (8).

A few works have been conducted to describe and establish the effectiveness of the Brunnstrom Approach. According to Upadhyay et al. (5), it has been described in other therapeutic settings; the authors highlighted it by identifying the recovery of function by

using reflexive move/basic movements. A study by Zulifiqar et al. There was also an improved hand function observed after 4 weeks of Brunnstrom movement therapy as compared to mirror therapy among the post-stroke hemiplegic patients proving that it can be beneficial in improving upper limb function. Furthermore, Shaheen and al.(8) showed that the comparative study between Brunnstrom therapy and low-level laser therapy achieve better result in upper limb function and hand dexterity in patient with chronic stroke. However, there are some complications and they include the variation in the results among the individuals and the fact that the advancements should undergo longer trials to become a standard in therapy as compared to other approaches (8,9).

Role of Goal-Directed Therapy in CP

Goal-directed therapy is a client-oriented treatment model which involves specific and functional goals for patients with the CP in accordance with their necessities and skills. It is different from other forms of therapy regarding the fact that the interventions are aimed at helping the patients increase their participation in the daily activities, instead of the impairment-based treatment (10). The therapy engages the patients and the family and put much focus on functional gains during the rehabilitation processes.

Thus, it is suggested that goal-directed therapy in CP may enhance the child's participation, quality of life and function improvements. For instance, Armstrong et al. (10) have presented a study in which children who were subjected to goal directed interventions as well as functional electrical stimulation, as well as adapted cycling reported enhanced motor functions and incremental satisfaction whilst achieving the goals. These findings are in concordance with the current trend in the development of individualized treatments to manage children with CP since the treatments focus not only on the motor disabilities but also on the quality of life.

Lacuna in the Literature

CP is one of the common neurodevelopmental disorders of motor function but till date, no consensus exists regarding the specific use of therapy for the improvement of motor function and functional independence for the patients. The Bobath NDT approach and

the Brunnstrom approach have been employed commonly but the comparative efficacy of these interventions are still not highly cleared. However, recent studies have indicated that there is actually evidence that goal-directed therapy could be of advantage but its comparison with other conventional techniques remain to be determined. Most of the past research studies have used each of these interventions in isolation; hence, comparison of the three approaches for the same group of CP patients is limited. Furthermore, the majority of the previous studies has aimed mostly at changes of motor functions while other effects of the mentioned interventions have not been taken into consideration in a sufficient manner. This study therefore seek to address these gaps by comparing the NDT (Bobath), Brunnstrom and the goal directed therapies in the management of CP while assessing the motor outcome, degree of functional self-reliance and the extent of spasms.

Research Question

What is the comparative effectiveness of Neurodevelopmental Therapy (Bobath Approach), Brunnstrom Approach and Goal-Directed Therapy for the management of CP patients, their spasticity and muscular spasms and achievement of rehabilitation goals?

MATERIALS AND METHODS

Study Design

The research is a parallel, three-arm, randomised controlled trial. Participants will receive treatments in the form of rehabilitation therapies following a set program and there will be assessments at the initial, middle and end of the trial period. This work will attempt to establish the impact of these interventions on motor function recovery, reduction in spasticity and muscle spasms and rehabilitation outcomes. The study will be done with reference to the Institute Ethical Standard.

Study Centre

The study will be carried out at a tertiary hospital in Udaipur Rajasthan India which is a specialized in treatment and rehabilitation of children with CP. The therapy is available with all the necessary resources to deliver bowl comprehensive therapy interventions The Clinical Team is proficient in the application of the Bobath, Brunnstrom and Goal-Directed Approaches.

Duration of the Study

The research study will take one year, from 2024 to 2025, to enable participants complete the given therapy interventions and time for intervention outcomes to be assessed.

Study Participants

The target population will be the persons diagnosed with CP who will attend the outpatient department of physiotherapy. in Mahatma Jyoti Phool Rao Univeristy.

Inclusion criteria

Relating to the inclusion criteria, patients with different motor deficit but clear indications for Neurodevelopmental Therapy, Brunnstrom Approach or Goal-Directed Therapy will be included.

Exclusion criteria

Patients with comorbid common diseases that may hamper the effects of the therapies such as uncontrolled epilepsy or severe dementia will be excluded.

Sample Size

The number of patients that will be in the study will be 60. Sample size shall therefore be arrived at statistically to allow the study to have enough power to measure differences in treatment efficacy of the three therapy modalities.

OUTCOME MEASURES

The primary outcomes of this study will be directed toward assessing effectiveness of the three rehabilitation strategies in patients with CP in terms of changes in motor functioning and decrease of the spasticity and muscle spasms. The key metrics include:

Spasticity: The change in muscle tone will be done using the Modified Ashworth Scale (MAS) which is the common change that is used in muscle tone assessments. The MAS recognizes the extent of spasticity by its measurement of the tonic resistance a patient exhibits when its muscles are passively moved. Patients' data will be accessed before and after these treatments in order to assess their effectiveness in lowering the clients' spasticity levels (11,12).

Motor Function: Gross Motor Function Measure (GMFM) as a measure of functional capacity will be employed for the same. More specifically, GMFM has been considered the most popular assessment tool in CP rehabilitation to address such functions as sitting, crawling, walking, and standing. For assessment of the change in gross motor skills over the course of the study a score shall be generated (13,14).

Goal Achievement: The Goal Attainment Scaling (GAS) will measure goal achievements of each patient concerning his or her set functional rehabilitation goals. Goal attainment scaling offers GAS as a more individualised way of measuring the progress since goals are set together with the patient and the caregivers to assure the definition of the objective, which is most relevant given the patient's condition (15,16).

Muscle Spasm Frequency and Intensity: The primary assessment tools will include, the visual Analogue Scale (VAS) for intensity of muscle spasm and daily log of the frequency of muscle spasm. It is important that caregivers or patients record presence of spasms, offer subjective and quantified data about how the therapies alter the mentioned spasms in terms of number and severity in the course of the treatment.

Other secondary outcomes are the patient and caregiver perceived quality of life based on the CP Quality of Life (CP-QOL) scale which will be administered at baseline, end-point and mid-terminal point.

The CP-QOL questionnaire is a standard and reliable instrument which aims at measuring the quality of life among the people with CP. It captures data across several

domains of health and welfare, which may be further physiologic, psychological, interpersonal, and occupational, the values of which are the patient, and/or his or her carers. Communication includes questions such as handlers' ability to recognize their dogs' body language; Social interaction encompasses questions like whether dogs get along well with other dogs or people; Pain and discomfort raises questions such as whether a dog cries vocally; Mobility includes questions like whether a dog can climb on furniture; Access to services has questions like whether a dog gets to go for a walk; and life satisfaction questions about a dog's overall quality of life in their home (17,18).

MATERIALS USED

The study will use different materials and equipment in order to be able to put into practice the rehabilitation interventions and facilitate the accurate records of the patient. Since, Neurodevelopmental Therapy (Bobath Approach), Brunnstrom Approach and Goal-Directed Therapy are to be administered as forms of treatment for developmentally delayed children; therapeutic tools shall be applied. There are thermast therapy mats for floor movements, stability and balance boards and Strobe resistance bands to build muscles. These tools are very vital in the achievement of the targeted exercises that are set for every therapy.

Similarly, assessment tools shall be applied in order to assess the efficiency of interventions. Patient's spasticity levels will be assessed using the MAS while the other key measure will be the ability of the child to have improved motor function as evaluated by the GMFM. Further, Goal Attainment Scaling (GAS) score sheets will be used to assess the results at the individual client's treatment goals that will capture the client's progress with respect to his or her particular needs.

During the whole research process, these devices which shall include video cameras shall capture the posture, motor control and movement patterns during the therapy sessions. Such recordings will offer a way of assessing the improvement that each patient had made in the course of treatment as well as guarantee the provision of the therapies.

Data collection forms shall be utilised throughout the sessions to record patient's information, as well as therapeutic effectiveness to ensure order and security in data handling. These will be augmented with electronic databases where the collected information will be stored hence making it easy to retrieve the data and conduct analysis during the course of the study.

PROCEDURE

The first procedure of this research will be screening and selection of participants in order to determine their qualifying status for participation. Once enrolled, they will be randomly assigned to one of the three intervention groups: The methods which can be applied include Neurodevelopmental Therapy (Bobath Approach), Brunnstrom Approach, or Goal-Directed Therapy. Each group will follow an equal treatment plan for the type of therapy implemented such that the intervention sessions will span for six months.

First of all, all the participants will undergo the baseline assessment. It is called baseline evaluation and involves the determination of relative severity by the use of parameters like the degrees of spasticity, motor tract changes, and the achievements of goals, as well as the quality of life. These will be used as the framework for the assessment of the progress all through the study.

Attendees will then enter the intervention phase of the treatment programme where they shall be attending individual therapy sessions three times in a week. The duration of each of the session will be between 45 and 60 minutes and it will be facilitated by qualified physiotherapist who will have specialized on the particular rehabilitation approach to the group/phase. Thus, the therapeutic interventions will in fact be focused on the needs of patients with CP, their aim being enhancement of motor function, decreasing of muscle tone or spasticity, and general rehabilitation objectives respectively.

To minimize interference, the instruments will be readministered at the mid-point of the study half way into the two-month period. This revaluation will help track the participants' spasticity, motor functions and overall progress with the objectives in between and then make necessary adjustments.

Consequently, after the three months of the intervention, the last end-point assessment of the entire effects of the specific therapies will be done. In a similar manner, in this evaluation, the efficacy of the three interventions will be compared on the basis of changes in motor function, muscle spasticity and overall rehabilitation goals.

Patients will be followed up using the same measures after 3 months as a way of evaluating the perceptions of sustained treatment effects and long-term impacts. This

follow-up will assist in establishing if the improvement in motor function is sustainable and whether the gains of the rehabilitation's interventions are enduring or not.

DATA MANAGEMENT AND STATISTICAL ANALYSIS

Every data will be properly collected and managed in a way that is consistent to ethical and data confidentiality standards. All paper-based assessment tools will be converted into database that will contain electronic format copy of the tool and only the research team will have access to these data. To achieve anonymity each participant will be referred to by an identification number. Data backup will be done frequently and quality of data in the database will always be checked. Such inconsistencies will be resolved in reference to the paper records used in the analysis of the data.

On the outcome measures mean, standard deviation will be computed. To apprehend the first outcome, a one-way ANOVA will be used in order to compare the utility of three types of therapy and that emerged as Neurodevelopmental Therapy, Brunnstrom Approach, and Goal-Directed Therapy to increase the motor function and decrease the appearance of spasticity. For the pairwise comparisons, post-hoc Tukey's will be applied in order to determine differences between group means.

The difference in neighbour and rater agreement for the assessments taken at follow-up visit is likely to be tested with intra-class correlation coefficient. Also, the Chi-square test will be used for the variables that can only have certain value, for example, patient characteristics, while the Data Analysis linear regression will be chosen to determine the factors that can influence the improvement of the motor functions and decreased muscle tone. The significance level which has been used in this research is $p < 0$. The statistical significance will be considered at 05 level or less On this basis, Further analysis will be done will be done on the data collected to compute for the chi square. Data will be analyzed by Statistical Package for Social Science (SPSS)

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RESULTS

Results of the data will be revealed after getting the analyzed data.