Comprehensive Pediatric Assessment and Rehabilitation of Hypotonic Cerebral Palsy using ICF Model of Functioning, Disability and Health: A Case Study

Nitika Roy[1]; *Paridhi Sharma[2]; Dr Sheetal Kalra[3]; Rajeev Kumar Singh[4]; Dr Richa Hirendra Rai[5]; Prince Rohilla[6]

[1] PhD Scholar, School of Physiotherapy, Delhi Pharmaceutical Science and Research University
[2] PhD Scholar, School of Physiotherapy, Delhi Pharmaceutical Science and Research University*
[3] Associate Professor & HOD, School of Physiotherapy, Delhi Pharmaceutical Science and Research University
[4] Assistant Professor, School of Physiotherapy and Rehabilitation Sciences, K R Mangalam University
[5] Professor, School of Physiotherapy Delhi Pharmaceutical Sciences and Research University
[6] Physiotherapist, VMMC & Safdarjung Hospital, New Delhi

*Corresponding Author- Paridhi Sharma
Email ID- paridhi19041994@gmail.com

Abstract—

Cerebral palsy (CP) remains the most prevalent neurodevelopmental disorder in children, frequently leading to significant disabilities that impact their daily lives and overall development. Among the various subtypes of CP, hypotonic cerebral palsy is notably the rarest, with a prevalence consistently reported to be below 5% of all CP cases. The clinical manifestations of hypotonic CP are intricate, involving a multitude of motor and non-motor impairments, which pose substantial challenges in both assessment and management. These complexities necessitate a comprehensive and nuanced approach to care.

The International Classification of Functioning, Disability, and Health (ICF) model serves as a robust and precise clinical framework, facilitating improved diagnostic accuracy and tailored management strategies for clinicians. This model encompasses a wide array of factors, including body functions and structures, activities, participation, and contextual factors, thereby providing a holistic view of the patient's condition.

In this pediatric case study, the ICF model is employed for a meticulous assessment and intervention plan for a child with hypotonic CP. The study underscores the model's efficacy in enhancing diagnostic and therapeutic outcomes by addressing the multifaceted needs of the patient. Furthermore, it highlights the critical role of standardized clinical models in effectively addressing the complexities associated with rare neurodevelopmental disorders, ultimately contributing to improved patient care and quality of life.

Key Words: Cerebral Palsy; Hypotonic CP; Neurodevelopmental Disorder; ICF Model; Therapeutic Management

1. INTRODUCTION

Cerebral palsy (CP) is a common neurodevelopmental disorder affecting children. It results from non-progressive brain damage, leading to movement and posture impairments. These impairments can cause functional difficulties, including sensory and motor dysfunction, perceptual issues, intellectual disabilities, behavioral problems, seizures, and secondary musculoskeletal problems. The causes of CP are diverse and can occur before, during, or after birth. Intellectual disability (ID) is a common comorbidity in CP, affecting up to 60% of cases. In India, Singhi et al. reported ID in 72.5% of affected children. Visual impairments, including strabismus, amblyopia, nystagmus, optic atrophy, refractive errors, and ocular motility disorders, are prevalent in approximately 28% of children with CP. Hearing impairment affects about 12% of children with CP, particularly those with etiologies such as very low birth weight, kernicterus, neonatal meningitis, or severe hypoxic-ischemic insults. Epilepsy is another common complication, occurring in 35% to 62% of children with CP. In an Indian study, 35% of children with CP were found to have epilepsy. Seizures were observed in 66% of children with spastic hemiplegia, 43% with spastic quadriplegia, and 16% with spastic diplegia [(Dureja et al., 2018); (Sankar & Mundkur, 2005); (Bhati et al., 2019)].

Speech impairment in CP is often caused by bilateral corticobulbar and oromotor dysfunctions. Both receptive and expressive language deficits are common, especially in conjunction with intellectual disability. Articulation disorders and impaired speech affect around 38% of children with CP. Sleep disorders, particularly in those with visual impairments, are prevalent in up to 50% of cases. Oromotor problems, including feeding difficulties, swallowing dysfunction, and drooling, can lead to nutritional issues and impact physical growth. Behavioral problems are also well-documented. Abnormalities in proprioception and tactile sensation are common. Additionally, psychiatric disorders such as anxiety, depression, conduct disorders, hyperkinesis, and inattention can occur in up to 61% of cases. Associated deficits may be more disastrous for the CP child than the motor problem [(Dureja et al., 2018); (Sankar & Mundkur, 2005); (Jan, 2006)].

Children with Cerebral Palsy (CP) demonstrate unique characteristics based on the type and distribution of motor symptoms, as well as the degree of functional impairment in specific areas (Levy et al., 2019). Cerebral palsy has two classification systems. One way to classify CP is through predominant motor characteristics which include Spasticity, Hypotonia, Athetosis, Ataxia and Mixed. Another way of classification is through topographical pattern of limb involvement which includes Monoplegia, Diplegia, Triplegia, Hemiplegia and Quadriplegia. Spastic CP accounts for nearly 70-80% whereas, non spastic CP makes for 20-30% of all cases (Dureja et al., 2018); (Sankar & Mundkur, 2005). Ataxic and hypotonic forms of CP are the rarest subtypes of CP, with a prevalence consistently estimated at less than 5% of all CP cases and robust data are generally lacking (Levy et al., 2019).

Children with spastic CP exhibit upper motor neuron signs, including weakness, hypertonia (increased muscle tone), hyperreflexia (exaggerated reflexes), clonus (rhythmic muscle contractions), and a positive Babinski sign. In contrast, hypotonic CP is characterized by extreme floppiness and an inability to generate sufficient muscle force to move against gravity. Hypotonia is generalized reduced muscle tone that persists beyond 2-3 years of age and is not caused by a primary muscle or peripheral nerve disorder. Many children with early hypotonia develop spasticity or dystonia by 2-3 years of age. (Dureja et al., 2018); (Sankar & Mundkur, 2005).

The primary goal of therapies and medical treatments for children with CP is to promote development and functional abilities. Enhancing participation in play, social activities, leisure, and school helps integrate children into their communities, improving both the child's and caregiver's quality of life (QoL). Given the higher prevalence of the rare hypotonic form of CP in India, research supporting evidence-based management tailored to the Indian context is crucial (Jindal et al., 2019).

The neurorehabilitation process for cerebral palsy (CP) is complex and demanding, impacting not only the child but also their family and the healthcare system. A multidisciplinary team approach is essential to optimize outcomes and enhance the child's participation in society.

The World Health Organization's International Classification of Functioning, Disability, and Health

(ICF) framework, along with its child-specific version (ICF-CY), provides a valuable tool for understanding the multifaceted nature of CP [(Trabacca et al., 2011); (Jeglinsky, 2012)]. By considering body functions and structures, activities, and participation, as well as environmental and personal factors, the ICF helps to identify and address the specific needs of each child with CP. Through a comprehensive rehabilitation program that includes physical, occupational, and speech therapy, as well as other specialized interventions, the goal is to maximize the child's potential and improve their quality of life (Trabacca et al., 2011).

As hypotonic form of Cerebral Palsy is the rare and may change into ataxic or hypertonic type with passing years, its manifestation along with its rehabilitation is difficult to predict [(Sankar & Mundkur, 2005); (Molnar, 1973)]. Also, there is a paucity of literature regarding use of a holistic biopsychosocial approach such as ICF model of functioning, disability and health for its assessment and management. Therefore, this case study is an attempt to provide a comprehensive assessment and rehabilitation using ICF model of disability.

2. PATIENT INFORMATION

2.1 Patient Scientific Information

A 1 year 6-month-old boy came to OPD 3, Department of Physiotherapy in the arms of his mother. The child was assessed on 31st July, 2021. The family resided in Vijay Park, New Delhi. The contact information was shared by the mother at the time of assessment.

2.2 Primary concerns and Patient Symptoms

The chief complaint was taken in the mother's words. Her primary concern regarding her child were that the boy was unable to stand or walk Independently and was unable to speak age appropriately.

2.3 History Taking

A. PRE NATAL HISTORY

The mother gave no history of drugs, alcohol intake or smoking before or during pregnancy. There was no history of infectious disease, Diabetes Mellites, Hypertension or Thyroid.

There was no history of exposure to toxins or radiations, malnutrition, seizures, severe proteinuria and use of drugs like anti-convulsant, anti-coagulants, anti-depressants or anti-epileptics. She did not give a history of genetic abnormalities or a previous child with developmental disabilities (Primigravida). There was no history of Rh compatibility, Chromosomal abnormality and Placenta previa.

B. NATAL HISTORY

The mother reported a Gestational period of 8 months. It was a normal vaginal delivery (NVD).

The mother gave no history of prolonged labor resulting in fetal distress or breech presentation during birth. There was no forceps injury sustained or mishandling of the child during birth. A cry was present at the time of birth.

Birth weight was 3.5 Kgs being within normal range.

C. POST NATAL HISTORY

The mother gave no history of infection encountered after birth. The child did not have any history of neonatal seizures or Jaundice after birth. The child was kept under observation for 2 days in the Neonatal ICU and thereafter discharged with stable condition.

APGAR Score at the time of birth was 6 (Moderately depressed).

D. DEVELOPMENTAL MILESTONES

GROSS MOTOR MILESTONES

As shown in table 1, the gross motor milestones of the child were delays and did not emerge age appropriately.

Table 1 Representing Gross Motor Milestones

MILESTONES	AGE
Neck holding	Well after 5 months
Supine to Prone	Approximately 8 to 9 months
Prone to Supine	Approximately 7 months
Rolling	Does not remember
Sitting with support	Does not remember
Independent sitting	Approximately 10 months
Standing with support	Approximately 15 months
Independent Standing	Not attained yet
Walking with support	Attained at 1 year 2 months
Independent Walking	Not yet attained

FINE MOTOR MILESTONES

As seen in Table 2, the child had already attained fine motor milestones before coming for physiotherapeutic management but the mother informed that these were delayed.

Table 2 Representing Fine Motor Milestones

MILESTONES	AGE
Bidextrous reach	Attained but delayed
Unidextrous reach	Attained but delayed
Immature pincer grasp., probes with forefinger	Attained but delayed
Pincer grasps mature	Attained but delayed
Imitates scribbling., tower of 2 blocks	Attained but delayed
Scribbles., tower of 3 blocks	Attained but delayed
Tower of 6 blocks	Attained but delayed

SOCIAL AND ADAPTIVE MILESTONES

As seen in Table 3, social milestones were achieved by the child age appropriately.

Table 3 Representing Social Milestones

MILESTONES	AGE
Social Smile	Approximately 3-4 months
Recognition of mother	Approximately 4 months of age

LANGUAGE MILESTONES

As seen in Table 4, the language milestones are delayed and were not achieved age appropriately.

Table 4 Representing Language Milestones

MILESTONES	AGE
Coo's	Well after 5 months
Babble's	Approximately 8 to 9 months
Imitation of words	Approximately 7 months
1-2 words	Does not remember

E. PAST MEDICAL HISTORY

Child was taken for consultation with Neurologist at a hospital in Delhi for developmental delay who referred him to private clinic for physiotherapy which was far from their place of residence. Therefore, was taken for a second consultation and was referred to OPD.

F. PRESENT MEDICAL HISTORY

Is on Vitamin D as per prescription by the doctor.

G. FEEDING HISTORY

Mother breast feeds the child. He was also put on a proper diet. Child is capable of feeding himself.

H. FAMILY HISTORY

There was no history of consanguineous marriage in the family and no history of other siblings being affected in the family.

I. SOCIOECONOMIC STATUS

According to the modified Kuppuswami Scale the family of the patient was of Upper class.

J. IMMUNIZATION HISTORY

Child was well immunized with all vaccines administered as per schedule.

K. PHYSIOTHERAPY HISTORY

Child received therapy at a private clinic which included MAT Exercises, Corner sitting, walking with rollator and standing with the help of standing frame which benefited the patient. As the clinic was far from their place of residence, the patient came to our OPD for further therapy sessions. First assessment was taken at 16 months of age.

2.3 Observation

Mother carried the child to the third floor OPD. She was cradling the child on the side of her body, all the while holding the child around the hips. He had his arms around her neck and legs wrapped around her trunk. Mother was handling the child well.

The mother informed that the child only walks and stands with 1 hand support or with baby walker at home. On observation the patient was able to maintain eye contact and his hearing was intact. There was no presence of scars, wounds, pressure soars, muscle wasting, edema or dysmorphic features. Drooling of saliva was evident. Speech was in the form of babble and monosyllables like 'mama' or 'dada'. Feet

observation revealed immature or under developed medial longitudinal arch.

As seen in Table 5, observation of transitions from one static position to another revealed the following:

Table 5 Representing Transition ability of child

TRANSITION	OBSERVATION
Supine to Side-lying	Able to transit independently
Supine to prone lying	Able to transit independently
Supine to sitting	Able to transit independently
Prone to supine	Able to transit independently
Prone to kneel sitting	Able to transit with some assistance
Sitting to standing	Able to transit with some assistance

Picture 1: Belly Crawling of Child

2.4 Examination and Diagnosis

A. PALPATION

On palpation, the limbs felt heavy indicating to reduced tone on muscle. The joints felt lax on range of motion. The warmth of the skin was normal.

B. HIGHER MENTAL FUNCTION

The child was alert at the time of assessment. He was oriented to place person and time. His immediate, recent and remote memory were all intact. He responded with babbles, 1 or 2 words and a smile. His sustained (played with his piano tiles for long period of time, selective (out of all the toys in front of him, he chose only piano tiles to play), alternating (his mother asked him to point to the fan and various other things while he was playing which he did and got back to playing) and divided (ate a biscuit while playing) attention were all intact. His complex cognition/ executive function was also intact (box of toys being kept at a height was beyond his reach, managed to pull at its end so all the toys would fall on the ground).

C. CRANIAL NERVES AND SENSORY EXAMINATION

Sensory and cranial nerve testing revealed that all sensation and cranial nerves were intact.

D. MOTOR EXAMINATION

i) MUSCLE TONE

Muscle tone according to Clinical Rating Scale was +1 representing mild to moderate hypotonia.

ii) FUNCTIONAL ACTIVE RANGE OF MOTION:

As seen in Table 6, functional ranges of motion for each joint were assessed using functional play activities as the child did not take commands.

Table 6 Representing ranges of functional motion of child

Functional ROM	Testing	Response
UPPER EXTREMITY	Child in long sitting position Child was asked to grab the ball overhead in a playful manner	Child grabbed the ball overhead (shoulder flexion, elbow extension and wrist extension) Child took the ball towards his chest (Shoulder extension, elbow flexion and wrist flexion)
LOWER EXTREMITY	Child in long sitting position with back supported.	Child kicked the ball (hip and knee flexion with ankle dorsiflexion)

	Child was asked to kick the ball in a playful manner placed in front of him with his feet	Returned to his starting position (knee extension with ankle plantarflexion)
TRUNK EXTENSION	Child in prone position He was asked to look towards his mother standing in front of him in a playful manner	Child extended his trunk while taking weight on his forearms
TRUNK FLEXION	Child in long sitting Toy placed in front of child which he was asked to pick.	Child without moving forward bend to pick up the toy (trunk flexion)
TRUNK LATERAL FLEXION	Child in supine Child tickled on the side of his trunk	Flexed his trunk on the side that was tickled (trunk lateral flexion)
TRUNK ROTATION	Child in prone position Child. Therapist held a toy at child's side and waved it to attract child's attention.	Child twisted his body to get the ring (trunk rotation)

iii) MANUAL MUSCLE TESTING

All the muscles of the body had a muscle strength of grade 3 (Fair- movement against gravity)

E. REFLEXES

Superficial reflexes like abdominal, plantar and corneal could be elicited normally. Deep reflexes including biceps, brachioradialis, triceps, knee jerk and ankle jerk had 1+ grade (Slight reflex, present but depressed, low).

Primitive reflexes like plantar reflex had not integrated. Matured reflexes like Labyrinthine head righting, Optical righting, Amphibian reflex and Body righting as well as Tilt reactions in sitting had emerged.

There was no evidence of limb length discrepancy or muscle tightness on examination. Head circumference was 45cm. Oromotor examination revealed weakness of muscles involved in swallowing although the child was able to eat small quantities of solid food.

F. BALANCE EXAMINATION:

Perturbation Test for balance performed in sitting (most recent position acquired without support) and the grade was 3 (Good Balance)- Interpretation:

Static-Patient able to maintain balance without hand held support

Dynamic- Patient accepts moderate challenge, able to maintain balance while picking up objects from the floor. Lost balance when maximum challenge was presented

Maintained standing position with one finger support (Lost balance when support was removed and caught himself by holding onto the leg of the therapist) revealing a grade of 1 (Poor Balance)- Interpretation

Static- Patient requires handhold support and moderate assistance to maintain position

Dynamic- Patient unable to accept challenge or move without loss of balance.

G. COORDINATION EXAMINATION:

Is able to perform Hand to eye coordination, Hand to mouth coordination, Hand to hand coordination as seen when manipulates objects in his hands (squeeze toys, crazy ball etc.), Visual tracking present, held the biscuit in right hand and nibbled at its ends. Picked up a small piece of biscuit from the ground using his fingers, pointed to his eyes and nose when asked by mother where his eyes and nose were, took the toy kept a little farther from the place where he sat with

his right hand while taking support on his left hand, played piano tiles.

Took out rings from the ring holder and placed them back in with little assistance. Held a pen offered by the therapist in his right hand and scribbled with it.

Bi dexterous reach present as the child reached with both hands to take the ball from the therapist, moved the beads of abacus with both hands and tried rolling toy with wheels on the floor with both hands

H. POSTURE

IN SITTING (Most recent stable position) (Pic. 2)

- Head- rotated to the right
- Right and left shoulder- Neutral
- Right and Left elbow- Slightly flexed
- Right and Left wrist- slightly flexed
- Right and Left hip- Flexed and abducted
- Right knee- Flexed
- Left knee- Extended
- Right and Left ankle- Slight plantarflexed

Picture 2: Sitting Posture of child

I. GAIT (In sagittal view)
Child was able to walk with help of a rollator or with 1 finger support. He walked with a wide base, toeing-out with full sole weight bearing, weight on the medial borders of the feet. There was no pelvic rotation to be noted. Had a short step length with 1 arm in high guard position and the other held by the therapist. Walked by slapping his feet on the ground (middle foot comes in contact with the ground first followed by anterior foot).

J. FUNCTIONAL ASSESSMENT

Functional assessment done through Gross Motor Functional Classification System (GMFCS) where the child was on level II -Belly crawls (Pic. 1), pull to stand on furniture and cruise, manipulates objects with hands.

2.5 Diagnosis

DIFFERENTIAL DIAGNOSIS

Down Syndrome- absence of dysmorphic features and mother gave no history of chromosomal abnormalities being detected.

Global Developmental Delay- MRI showed abnormal findings.

INVESTIGATION

MRI Imaging of the brain shows T2W and FLAIR hyperintensities in bilateral parietal periventricular white matter. No restriction on DWI or blooming on gradient images was noted.

Rest of the brain parenchyma, cortical sulci, basal cistern, ventricular system, bilateral paranasal sinus, visualized orbits, basal ganglia and thalami along with posterior fossa structures and intracranial vessels were normal. There was no midline shift.

MEDICAL DIAGNOSIS

Cerebral Palsy

REHABILITATION DIAGNOSIS

Generalized Hypotonia with developmental delay

FUNCTIONAL DIAGNOSIS USING ICF MODEL OF DISABILITY

IMPAIRMENTS

Anatomical- hyperintensities in bilateral parietal periventricular white matter

Physiological- low tone, muscle weakness, drooling of saliva, inability to produce age-appropriate speech

ACTIVITY LIMITATION

Unable to communicate age appropriately, Unable to walk or stand without support

PARTICIPATION RESTRICTION

Unable to converse with people effectively, unable to explore the immediate environment due to inability to ambulate effectively.

2.6 Physiotherapy Management

List of Problems:

- Delayed motor and speech milestone.
- Drooling
- Hypotonia
- Difficulty crawling with quadruped position
- No independent walking
- Independent transition from prone to kneel-sitting and sitting to standing difficult
- Balance issues in sitting, standing and walking

Short- and long-term goals were set for the management:

Short term goals:

- Increase tone through various neurological approaches.
- Reduce drooling through oromotor stimulation technique.
- Improve transitions.
- Strengthening of weak muscles
- Work on achieving age-appropriate speech
- Improve balance in sitting and standing
- Achieve independent standing
- Counsel and educate the family for management of disorder and proper handling of the child
- Teach the family home exercise program

Long term goals:

- Able to produce age-appropriate speech
- Child able to sit and stand without support or loss of balance.
- Can walk and climb stairs independently
- Ability to perform age-appropriate functional activities
- Regular follow ups and reassessment.

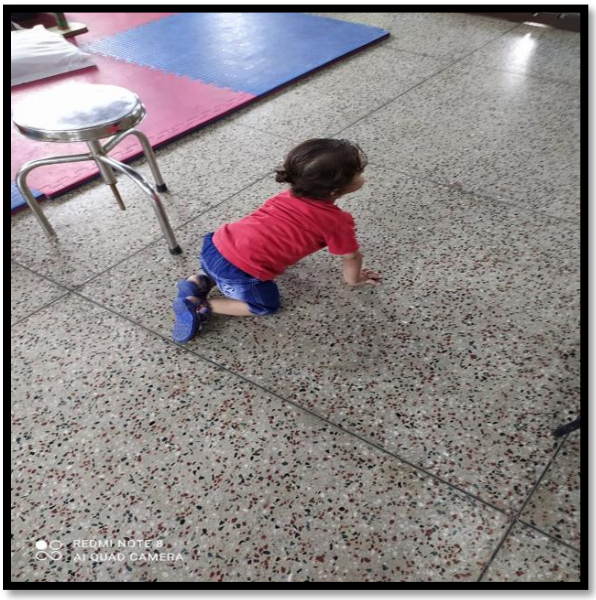
As seen in Table 7, after setting the treatment goals, exercise protocol including type of intervention, dosage for intervention and results was devised.

Table 7 Treatment protocol: Type, dosage and result of intervention.

Type of Intervention	Dosage	Result of Intervention
Joint Approximation (Rood Approach)	Shoulder, elbow, wrist, MCP, IP Joints 10 repetitions at each joint	Increased tone in muscles
Proprioceptive loading (Rood Approach)	Using MAT Exercises including maintaining quadruped position squatting, half kneeling and kneeling for 2 minutes for 5 times with resting period of 1-minute bridging (10 repetitions with hold of 10 seconds), squat to stand (2 sets	Helped strengthening the muscles. Able to hold trunk while crawling.

	of 10 repetitions) Trampoline jumping in standing for 10 min	
Supported Standing	Bed side standing for 10 minutes in each session where minimal support is given around pelvis	Helped in integration of plantar reflex and development of medial arch
Supported walking	Walking with help of rollator or with minimal support around the pelvis	Was able to stand and walk without support and did not lose balance for upto 1 min
Balance Training	Child taken in sitting, four-point kneeling and standing on a wobble board and the board was tilted side to side, forward and backwards. Child was expected to maintain balance.	Helped in emergence of tilt reaction and staggering reaction.
Faradic Stimulation (Trapezoidal impulses, 50Hz)	2 Electrodes placed on abdomen for 5 minutes and child to do bridging. 2 electrodes placed on lumbar area for 5 min and child was to do assisted crunches.	Helped build strength in back and core muscles
Dynamic Balance	Reaching out activities in sitting. Walking on parallel bars with support around pelvis (side walking, back walking, tandem walk). On spot marching and staircase climbing.	Helped in training dynamic balance (added very recently)
Speech training	Repeated sounds that go with physical activity and games. Various vowel sounds said to him and rewarded the child with praise and claps. Said each one several times and allowed the child to repeat. Picked him up and hugged him while doing the activity.	Was able to say and repeat several more words.
Counselling	Explained the condition of the child to parents along with the importance of the treatment protocol. Parents instructed to not force the child to perform certain activities. Explained the home program to parents and the importance of helping the child become more independent. Exercises were to be done 2 times at home daily.	Parents had more clarity at the end of counselling session.
Follow up	The level of improvement was checked every 15 days	Transitions were done with more ease.

	Speech was improved. Child able to stand without support. Dynamic balance in sitting got better. Able to maintain quadruped position while crawling (Pic. 3).



Picture 3: Child is able to maintain quadruped position while crawling.

3. DISCUSSION

This case study was conducted on an infant boy with hypotonic cerebral palsy. Hypotonia in infants and children can be an inconspicuous clinical presentation, which often leads to inaccurate evaluation. Stepwise and accurate assessment is important to reach the correct diagnosis promptly which will in turn be critical to predict the clinical course, associated manifestations, complications, prognosis, and provide genetic counseling [(Jan, 2006); (Leyenaar et al., 2005)].

We used the most widely accepted WHO's ICF Model of functioning, disability and health for a more comprehensive assessment and management of hypotonic Cerebral Palsy.

The ICF, developed through global collaboration, provides a framework for understanding health and disability. Its child-specific version, the ICF-CY, focuses on children's participation in daily and community activities. The ICF recognizes that health is influenced by a complex interplay of factors, including body functions and structures, activities, participation, environmental factors, and personal factors. By considering these factors, the ICF emphasizes a holistic approach to assessment and intervention. Historically, disability has been viewed through two main lenses: the medical model and the social model. The medical model focuses on individual impairments and seeks to restore normal function. The social model, on the other hand, emphasizes societal barriers and advocates for environmental modifications to promote inclusion. The ICF integrates elements of both models, adopting a biopsychosocial perspective. This approach recognizes that health is influenced by biological, psychological, and social factors. By considering all these factors, the ICF provides a comprehensive framework for assessing individual needs and developing effective interventions. The ultimate goal of rehabilitation is to optimize a child's functioning and participation in all aspects of life. By applying the ICF framework, healthcare professionals can work towards this goal by addressing both the individual's impairments and the environmental barriers that may hinder their full participation [(dos Santos et al., 2011); (Andrade et al., 2012); (Schiariti et al., 2014); (Vargus-Adams & Majnemer, 2014)].

The concepts raised by ICF were used in clinical evaluation and rehabilitation of the boy in this case study. Firstly, all the aspects that can influence child's health condition were considered in the assessment and management [(dos Santos et al., 2011); (Andrade et al., 2012); (Schiariti et al., 2014); (Vargus-Adams & Majnemer, 2014)]. Mother's chief complaints about delays in motor and language milestones were recorded. An elaborate history was taken to identify any prenatal, perinatal or post-natal etiopathology for encountering cerebral palsy, which revealed a pre-term infant. A present and past

medical history along with feeding, family, socioeconomic, immunization as well as physiotherapy history were documented. Anatomical impairment due to ischemic injury to the brain resulting in physiologically reduced muscle tone (hypotonia), depressed reflexes, generalized muscle weakness resulting in drooling of saliva and limb weakness.

Secondly, the functional capabilities and limitations of the child with CP were emphasized [(dos Santos et al., 2011); (Andrade et al., 2012); (Schiariti et al., 2014); (Vargus-Adams & Majnemer, 2014)] including inability to perform certain transfers, issues with balance, delayed motor and language milestones resulting in inability to speak, walk and crawl age appropriately. Gross Motor Functional Classification System (GMFCS) where the child was on level II. Improvements in the functional status were noted after 1 month of therapy.

Thirdly, contextual factors present in the children's life which can facilitate or hinder their participation in the society were also considered [(dos Santos et al., 2011); (Andrade et al., 2012); (Schiariti et al., 2014); (Vargus-Adams & Majnemer, 2014)]. Inability to speak age appropriately, in future, would have restricted the child's ability to communicate effectively. Inability to walk, crawl and perform transfers would restrict the child's ability to explore his immediate environment. Environmental barriers such as non- availability of ramps in buildings, transportation facility etc. could restrict child's participation in society.

Lastly, the rehabilitation process should be focused on improving quality-of-life by emphasizing what a child can and wants to execute within the environment. This means that rehabilitation choices are focused on the child's engagement in daily activities rather than on correcting the deviation from normality [(dos Santos et al., 2011); (Andrade et al., 2012); (Schiariti et al., 2014); (Vargus-Adams & Majnemer, 2014)]. In this case study, a multi-disciplinary approach was used for rehabilitation where the parents and the therapist were in contact with the child's neurologist updating him constantly on the level of progress. A speech therapist was also consulted who worked on the achievement of language milestones. An occupational therapist worked on the child's upper limb strength and coordination training. Counselling was given to the parents to help them understand the child's condition, various challenges which the child might encounter, importance of adhering to the rehab and the positive implications of the treatment protocol. An exercise program was devised along with a home program so as to actively involve the parents in the rehabilitation process of the child.

Limitations of the study were that the child was only assessed by the therapist for 2 months. Case study was done on a single child rather than multiple pediatric cases assessed simultaneously.

4. CONCLUSION

The ICF Model of functioning, disability and health is a holistic approach spanning biopsychosocial aspects related to health and QoL of an individual. This theoretical framework has evolved recently to incorporate its conceptual and clinical use for assessment and management of a patient, but it's use is limited, especially in pediatric assessment and management. As clinical manifestations of hypotonic cerebral palsy can be difficult to assess and manage, ICF model can be a helpful clinical tool for all clinicians. Since there is a paucity of literature regarding its use in the clinical context, it becomes imperative to conduct more research with recruitment of larger sample to establish its efficacy in the pediatric population.

Declaration

Informed Consent: written informed consent for publication of this case report was obtained from the parents of the patient. A copy of the consent form is available for review by the editor of this journal.

Funding - It's a self-funded study.
Conflict of Interest Statement- All the authors have no conflict of interest to report.

References

Andrade, P. M. O., Haase, V. G., & Oliveira-Ferreira, F. (2012). An ICF-based approach for cerebral palsy from a biopsychosocial perspective. *Developmental Neurorehabilitation*, *15*(6), 391–400. https://doi.org/10.3109/17518423.2012.700650

Bhati, P., Sharma, S., Jain, R., Rath, B., Beri, S., Gupta, V. K., & Aneja, S. (2019). Cerebral palsy in North Indian children: Clinico-etiological profile and co-morbidities. *Journal of Pediatric Neurosciences*, *14*(1), 30–35. https://doi.org/10.4103/jpn.jpn_46_18

dos Santos, A. N., Pavão, S. L., de Campos, A. C., & Rocha, N. A. C. F. (2011). International classification of functioning, disability and health in children with cerebral palsy. *Disability and Rehabilitation*, *34*(12), 1053–1058. https://doi.org/10.3109/09638288.2011.631678

Dureja, K., Verma, S., & S, M. (2018). Effect of therapeutic taping on functional sitting control during an exercise session in children with hypotonic cerebral palsy. *International Journal of Health Sciences and Research, .*, *8*(9), 71–79.

Jan, M. M. S. (2006). Cerebral Palsy: Comprehensive Review and Update. *Annals of Saudi Medicine*, *26*(2), 123–132. https://doi.org/10.5144/0256-4947.2006.123

Jeglinsky, I. (2012). Family- Centeredness in services and rehabilitation planning for children and youth with cerebral palsy in Finland. *Karolinska Institute (Sweden)*.

Jindal, P., Macdermid, J. C., Rosenbaum, P., Direzze, B., Narayan, A., & Nayak, S. L. (2019). Treatment and re/habilitation of children with cerebral palsy in India: a scoping review. *Developmental Medicine & Child Neurology*, *61*(9), 1050–1060. https://doi.org/10.1111/dmcn.14211

Levy, J. P., Oskoui, M., Ng, P., Andersen, J., Buckley, D., Fehlings, D., Kirton, A., Koclas, L., Pigeon, N., van Rensburg, E., Wood, E., & Shevell, M. (2019). Ataxic-hypotonic cerebral palsy in a cerebral palsy registry. *Neurology: Clinical Practice*, *10*(2), 131–139. https://doi.org/10.1212/cpj.0000000000000713

Leyenaar, J., Camfield, P., & Camfield, C. (2005). A schematic approach to hypotonia in infancy. *Paediatrics & Child Health*, *10*(7), 397–400. https://doi.org/10.1093/pch/10.7.397

Molnar, G. E. (1973). CLINICAL ASPECTS OF CEREBRAL PALSY. *Pediatric Annals*, *2*(12), 10–27. https://doi.org/10.3928/0090-4481-19731201-04

Sankar, C., & Mundkur, N. (2005). Cerebral palsy-definition, classification, etiology and early diagnosis. *The Indian Journal of Pediatrics*, *72*(10), 865–868. https://doi.org/10.1007/bf02731117

Schiariti, V., Klassen, A. F., Cieza, A., Sauve, K., O'Donnell, M., Armstrong, R., & Mâsse, L. C. (2014). Comparing contents of outcome measures in cerebral palsy using the international classification of functioning (ICF-CY): A systematic review. *European Journal of Paediatric Neurology*, *18*(1), 1–12. https://doi.org/10.1016/j.ejpn.2013.08.001

Trabacca, A., Russo, L., Losito, L., Rinaldis, M. D., Moro, G., Cacudi, M., & Gennaro, L. (2011). The ICF-CY Perspective on the Neurorehabilitation of Cerebral Palsy. *Journal of Child Neurology*, *27*(2), 183–190. https://doi.org/10.1177/0883073811415852

Vargus-Adams, J. N., & Majnemer, A. (2014). International Classification of Functioning, Disability and Health (ICF) as a Framework for Change. *Journal of Child Neurology*, *29*(8), 1030–1035. https://doi.org/10.1177/0883073814533595