



# AN OVERVIEW ON RECENT TREND IN PEDIATRIC PHYSIOTHERAPY

Tejashri B. Kadu\*, Prajakta N. Dongare, Priyadarshani G. Patil, Sachin J. Dighade, Teena S. Bodakhe

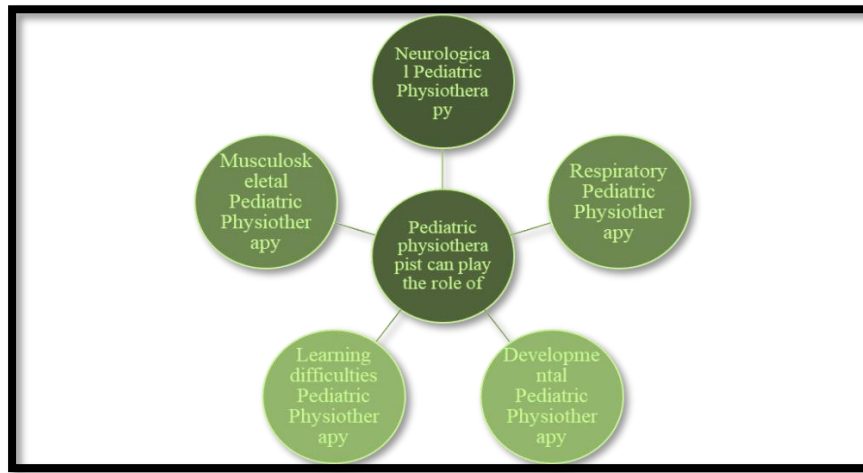
Institute of Pharmacy and Research, Anjangaon bari road, Badnera, Amravati. 444701. M.S. India.

**Abstract:-** Latest therapy and technique in the area of physiotherapy are crucial for enhancing the quality of life of children with Cerebral palsy, Torticollis, Spina bifida. Traditional physiotherapy is diverse from intensive pediatric physiotherapy, in current review state that the latest trend and technique in the form neuromuscular stimulation, suit therapy along with conventional physical therapy treatment. In case of Intensive physical therapy a child participate in rehabilitation session for prolong period. Intensive physical therapy is mostly implement in western countries & all around world. Physiotherapy treatments provides positive impact for minimizing the symptom and reduce pain during the treatment.

**Index term:-** Physiotherapy, Pediatric, Cerebral palsy, Torticollis, Spina bifida.

## INTRODUCTION

Physiotherapy is presumed to be a fundamental component of clinical practice and is a core competence identified as therapeutic hands-on technique[1]. It is also concerned with maximizing quality of life and improve movement potential physiotherapy management concerned with promotion, prevention, intervention, habitation and rehabilitation. To maintain and restore the physical health and also to maintain psychological and social well-being certain physical approaches are used by physiotherapist. It is science-based, committed to enhancing, applying, evaluating and reviewing the evidence that derive and appraise its practice and delivery. Pediatric physical therapists are healthcare professional who are specifically trained to improve the lives and daily function of children who suffer from a wide range of injuries and congenital conditions. Physical therapy focus on components of the international classification of functioning, disability and health. Pediatric patients range from infants in the neonatal intensive care unit to teenage competitive athletes, specifically 0 to 18 years of age and young adults with childhood disorders. The scope has increased considerably in the last few years to decades though India is in its infancy[6]. Despite this view on the significance of therapeutic touch as a crucial element of clinical practice, tension has arisen around the use of therapeutic touch in pediatric physiotherapy, particularly concerning children with cerebral palsy[1]. Pediatric physiotherapists are specialists in the assessment, identification, diagnosis, and treatment of disorders of movement and physiological issues. They treat children (infants up until the age of 19 years) in the areas of orthopedics, congenital malformations, neurology, neuropsychiatry, breathing and prematurity[1,4].



**Figure1: Roles of pediatric physiotherapy**

**Various physiotherapy pediatric treatment approaches:-**

1. **Cerebral palsy:-** Cerebral palsy is characterized as a group of permanent disorders of the development of movement and posture causing activity obstruction, that attribute to non-progressive disturbances that occurred in developing fetal or infant brain. It is principle neuromotor disorder that affects the development of movement, muscle tone and posture. The fundamental pathophysiology is an injury to the developing brain in the prenatal phase through neonatal period[19]. Although the initial neuropathologic lesion is non-progressive, children with CP may develop a range of secondary conditions over time that will variably affect their functional abilities[19,20]. Causes for cerebral palsy Low birth weight, Premature birth, Multiple births, Assisted reproductive technology infertility treatments, Infections during pregnancy , kernicterus, Birth complications.

**Table 1: Type of cerebral palsy**

Types of cerebral palsy:	Characteristics
1) <b>Spastic cerebral palsy</b>	It is the most common type of disorder, in this child experience stiffness in their muscles which causes repeated or awkward movement. Depending on their body parts affected they are classified as: <b>a) Spastic hemiplegia:</b> In these arms are more affected than legs. <b>b) Spastic diplegia:</b> Causes difficulty in walking due to tight hip and leg muscles cause their legs to pull together, turn inward, and cross at the knees (also known as scissoring). <b>c) Spastic quadriplegia:</b> Most severe form and affects all four limbs, the trunk, and the face and are usually unable to walk and often have trouble speaking[27,28].
2) <b>Dyskinetic cerebral palsy.</b>	It involves slow and uncontrollable jerky movements of the hands, feet, arms, or legs. The face muscles and tongue may be affected and cause some children to drool or make faces.
3) <b>Ataxic cerebral palsy</b>	In these they face problems with balance and coordination and experience difficulty in walking and have a hard time with quick or precise movements such as writing, buttoning a shirt, or reaching for a book [28-30]
4) <b>Mixed types cerebral palsy</b>	The most common type of mixed cerebral palsy is spastic-dyskinetic cerebral palsy[29].

## Physiotherapy Method of Cerebral Palsy

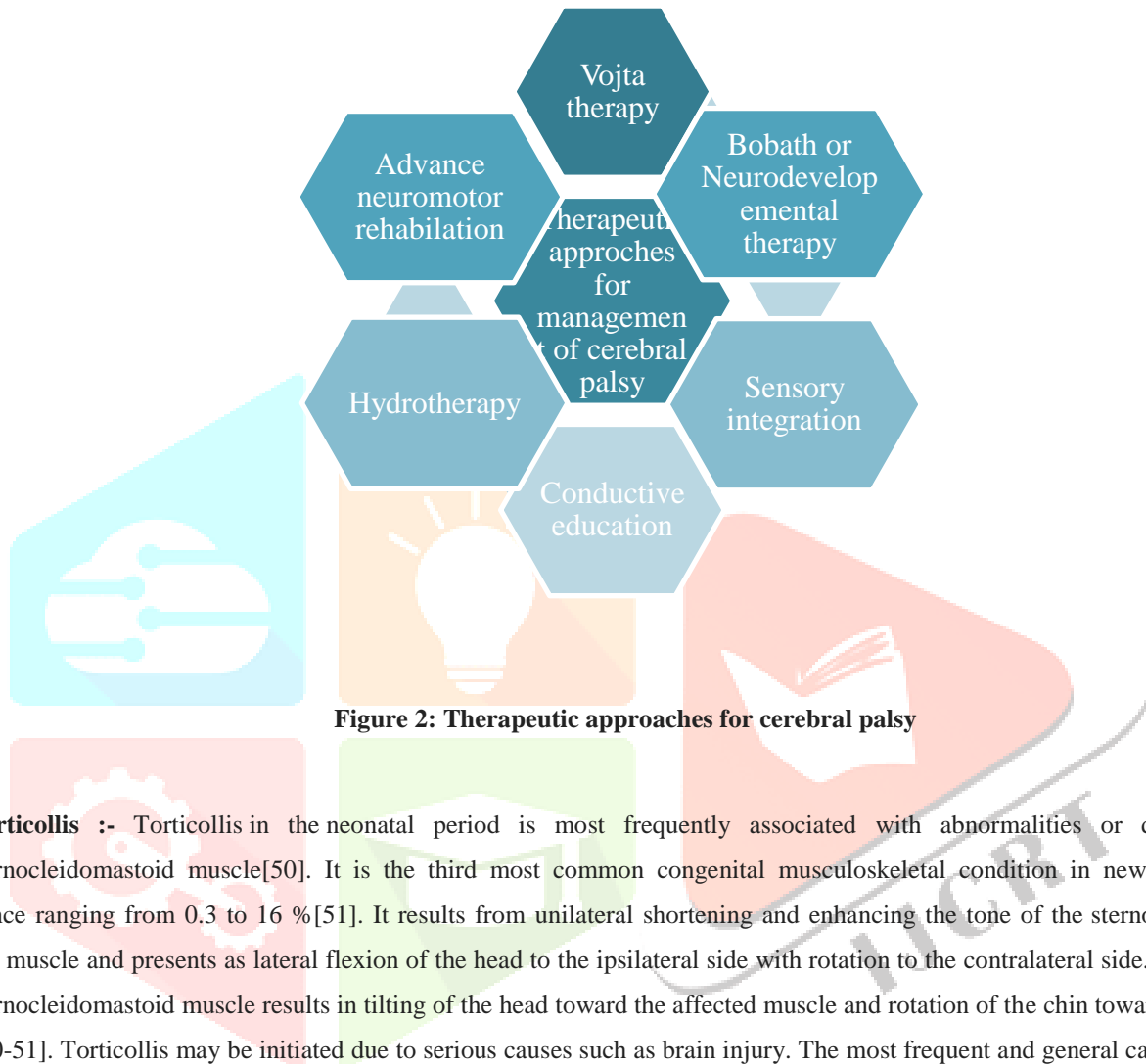
**a) Stretching exercise:-** The main purpose of stretching is to make a muscle longer. Stretching is an elongation of the connective tissue, muscles and other tissues around a joint. Passive stretching, can carry out manually or by external devices such as splints, casts or tilt-table, and is given in most spastic children to combat soft tissue tightness[33]. Passive stretching has been shown to enhance the rotation of motion in children with cerebral palsy[34,35]. For stretching technique individual lay supine on a foam mat, with the physiotherapist positioned to the side of the individual, opposite to the leg being stretched. The leg was lifted with the knee flexed to 90°, so that to obtain initial stretch position. To begin the stretch of the gastrocnemius muscle, the physiotherapist's hand was cupped around the heel, with the palm of the hand flat against the foot. The knee was supported and slowly guided into full extension. This position was maintained by pressure at the region of proximal tibia. Once the knee was locked in an elongated position, the ankle was slowly dorsiflexed, with pressure from the hand and forearm on the plantar surface of the forefoot. Joint rotation continuously provided by the physiotherapist until feedback from the individual indicated the point of discomfort. This point was considered to be maximal dorsiflexion. Once in a maximal stretch position, the joint was held for a period of 20 s. A similar method was used to assess maximum dorsiflexion angle before and after a set of five passive stretches[36,37].

**b) Neuromuscular electrical stimulation:-** Neuromuscular electrical stimulation (NMES) is a rehabilitative technology in which electrical stimulation is applied either to the skin surface or by implanting electrodes to amplify or to enhance the skeletal muscle contraction, through intact peripheral nerves[38]. NMES has been used as a method to strengthen muscles in the individual with cerebral palsy[39]. It involves application of transcutaneous electrical current which results in muscle contraction the cross-sectional area of the muscle and by increased recruitment of type 2 muscle fibers. Threshold electrical stimulation (TES) is also applied transcutaneous, is of low intensity, and does not evoke actual muscle contraction. TES is presumed to act by augmenting the muscle blood flow and bulk. the electrical stimulation is used in children more than 4-5-years-old with diplegic or hemiplegic CP. Each session of NMES normally lasts from 15 to 30 minutes, with fluctuating frequencies of half hour to up to 21 hours per week, for duration that ranges from 1 month to 1 year. Electrical stimulation is usually used for lower terminal muscles. TES is routinely given for 8-12 hours during sleep at home, and used for up to 1 year[41].

**c) Hippotherapy:-** It has been determined that the recreational use of riding can improve coordination, gross motor skills, posture, control of the head and coordination[42]. The horse provides a dynamic support base, rendering it an excellent tool to improve the strength of the trunk and to boost control and balance, as well as overall posture and resistance, weight distribution and motor skills. In hippotherapy, a physical therapist controls the horse to maintain the child's posture, balance, coordination, strength and sensorimotor systems while the child interacts with the horse and responds to the movement of the horse[43]. The warmth and shape of the horse and the rhythmic, three-dimensional movement of horseback riding are believed to improve the flexibility, posture, balance and mobility of the rider. It is said that the physiological effects of exercise using hippotherapy mean that child experience movement similar to walking through their trunk[44]. The movement in the saddle when the horse is walking slowly is similar to the movement of the pelvis that healthy child produces while walking, as a result strengthening the muscles of the trunk and improving their capacity to balance as the trunk responds to the movement. The result can be seen upon completion of the treatment with hippotherapy[44,45]. Some reports proved the benefits of horseback riding therapy on reducing abnormal tone, promoting motor performance, creating symmetric alignment and improving postural awareness, gait and mobility, but no significance benefits found of hippotherapy for children with cerebral palsy. Despite of lack of evidence on the benefit, horseback riding therapy is often recommended by physiotherapist for children with CP to improve gross motor function[43- 46].

**d) Adeli Suit Therapy:-** The suit is claimed to provide a vertical load of 30 to 80lbs of pressure-giving proprioceptive input and to enhance the function of vestibular system. The suit is composed of a cap, a vest, shorts, knee pads, shoes with attached auxiliary equipment, and a bungee cord to connect auxiliary equipment. The pieces are combined together with bungee type cords. The cords are adjustable for the application of differing degrees of tension to the child's different muscle groups. The bungee cords are placed to retain the body properly aligned and to forcibly uplift movement within a normal range of motion. To reposition the limbs in order to correct for abnormal muscle alignment, the bungee cords are adjusted by therapists to mimic normal flexor and extensor patterns of the major muscle groups[48,49]. The therapy procedure initiates with stretching and massage before wearing

the suit and performing therapy. The mechanism behind the Adeli suit is that through active movement therapy, the brain is stimulated and thus is reeducated to identify, the correct movement of the muscles[48,49]. The suit enhances communication between the brain and peripheral muscles, especially, the head and trunk control muscles, and along with locomotor functions of the legs. Developers of the Adeli suit affirm that the suit enhances communication between the brain and peripheral muscles by increasing blood flow, EMG readings, EEG function, while reducing ataxia and the intensity of dysarthria.



**Figure 2: Therapeutic approaches for cerebral palsy**

**2. Torticollis :-** Torticollis in the neonatal period is most frequently associated with abnormalities or deformities of the sternocleidomastoid muscle[50]. It is the third most common congenital musculoskeletal condition in new-born with an incidence ranging from 0.3 to 16 % [51]. It results from unilateral shortening and enhancing the tone of the sternocleidomastoid (SCM) muscle and presents as lateral flexion of the head to the ipsilateral side with rotation to the contralateral side. Shortening of the sternocleidomastoid muscle results in tilting of the head toward the affected muscle and rotation of the chin toward the opposite side[50-51]. Torticollis may be initiated due to serious causes such as brain injury. The most frequent and general cases seem to be associated to dysfunctions in the local neuromuscular mechanisms. Cervical dystonia is most frequent among the focal dystonia's in adults, which leading to a tetanus contraction of the sternocleidomastoid muscles[52]. Generally, torticollis is posttraumatic (10 to 20%) in most of the case and the remaining is idiopathic. The onset of posttraumatic cervical dystonia is usually within days of injury and 3 to 12 months after injury in the delayed form. Congenital muscular torticollis is present in less than 0.4% of infants[50-52]. Neurological Examination helps in the diagnosis of torticollis, in these examination electrodiagnostic test measure electrical activity in sternocleidomastoid muscles and determine the nerve damage[52]. Causes for torticollis are traumatic brain injury, inappropriate position of neonates in mother's womb (uterus), An abnormal development in the SCM, A collection of blood in infant's neck muscles (hematoma), Abnormal thickening of muscle tissue (fibrosis), Klippel-Feil syndrome, a rare birth defect that causes the vertebrae in infant's neck to fuse, Arthritis of the neck.

Sandifer syndrome, a rare condition that combines GERD with neck spasms[54,55]

### Physiotherapy Method of Torticollis

**a) Neck stretching exercises:-** The main objective of stretching is to prevent facial and skull deformities, limitation in neck movement, muscular imbalance, and postural changes in infants with cerebral palsy[62]. Stretching exercise are perform by associating with neck passive range of motion and manual stretching. The stretching in side flexion and rotation is retained for

about 10 seconds. The therapy period is considered for about 5 months infants with SMT have a longer therapy period than infants without a tumor. In each session the physiotherapist performed 3 repetitions of 15 manual stretches in a combination of side flexion and rotation, with each stretch retain for 1 second. This stretching exercise is performed 2 to 3 times per week. The infants with congenital muscular torticollis are at risk of a delay in achieving early motor milestones. Therefore, stretching exercises focus on impairments of ROM in rotation and lateral flexion of the neck and symmetric head posture. Symmetric head posture in this study is defined as no head tilt. the treatment time needed to accomplish a good result in ROM and head posture[63,64].

**b) Kinesiology taping:-** Kinesiology taping(KT) is a therapeutic appliance which associates to enhance the frequency within musculoskeletal rehabilitation. Generally, it is complementary treatment and it is plan to promote the body's natural healing process at the same type providing support and stability to muscles and joints without confining the body's ROM and maintain preferred body alignment[65]. Several physiotherapists use kinesiology taping in the treatment of congenital muscular torticollis. The benefits of using kinesiology tape (KT) to improve the muscular imbalance of the lateral neck flexors on infants. Taping is depended on following techniques[65].

**Table 2: Taping technique**

Muscle facilitation technique	Muscle-relaxing technique
In these, the tape was applied across the sternocleidomastoid muscle and along the superior aspect of trapezius muscle without any stretch in the tape.	In these, the tape was applied across the sternocleidomastoid muscle with a mild stretch

**c) Microcurrent therapy:-**Microcurrent therapy is low intensity alternative current (100~200 microamperes)and works at the microampere level and mimics the electrical intensity found in living tissue. The infants feel no sensation during treatment. Microcurrent was used in of treatment for congenital muscular torticollis by reducing in head tilt, by enhancing in neck rotation. Microcurrent therapy is applied for the infants below or under 3 months of age[67].This therapy is performed by transmitting current through 1 frequency channel using 2 body contacts. Alternating current transfer from one electrode to the other associating with a ramped square wave. Voltages of 1 to 600  $\mu$ A match the electrical current obtain in human tissue. Frequency-specific microcurrent (FSM) utilizes the same ramped square wave and voltages as microcurrent, but is delivered through 2 channels, with the help of 4 body contacts, beside with wet towels, gel electrodes, or a combination of both. Channel A frequencies target edema while channel B can target the edematous muscle. The FSM frequencies are responsible to cause biologic resonance with the electromagnetic bonds in living tissue, same as vibration. When FSM frequencies is equal to the electromagnetic bond frequencies in the targeted tissue, oscillations of the bonds interrupt them, allowing for reestablishing. Frequencies have been established for different conditions and tissue types. When these FMS are applied along with conservative treatment (stretching, strengthening, and positioning) then it is successfully applicable in managing torticollis in a toddler[68].

**D) Paraffin therapy:-** Paraffin therapy provides surface heat to muscle and tendon tissue and relaxes the smooth muscle fibers in the arterioles, improving local circulation. Paraffin therapy shows the positive impact on CMT in children[69].

**E) External Therapy of Herbal Medicine with Tuina:-** External therapy of herbal medicine (ETHM) is the application of drugs on the surface of an illness, acupoint. It is widely applied therapy now days, because of the high compliance for infants and negligible side effects. ETHM is absorbed trans dermally in the form of creams, ointments, powders, and liquids, used in the form of patch therapy or applied as medium during tuina treatment. Traditional Chinese medicine massage, which is also refer as tuina, and its main objective is to stimulate specific acupoints on the surface of the body to get desire functional effects. , ETHM performed with tuina for improving CMT effectin the infants[70].

**3) Spina bifida:-**Spina Bifida is a congenital malformation in which the spinal column is split (bifid) as a result of failed closure of the embryonic neural tube during the fourth week post-fertilization (at around 28 days of gestation) and is more common among children. Myelomeningocele, is refer as spina bifida, and is a neurogenetic disorder in these the spinal cord is open dorsally,

forming a placode on the back of the newborn baby that frequently rests on a meningeal sac (then named spina bifida cystica). The vertebrae at the level of the lesion lack neural arches, and so are incomplete dorsally. It is due to overlying bones and skin are incompletely formed and the corresponding area of the spinal cord is exposed to amniotic fluid in utero. It is the most common birth defect affecting the central nervous system that results in permanent disability. It affects the brain function that involve cognition, behavior, and adaptation, along with the more recognize complex effects of neurological dysfunction on multiple organ systems. The children found difficulty in speech and language characteristics, hyper sociality, good word reading, and due to lower limb weakness causes difficulty in walking, and lack of sensation that enhances the risk of pressure sores[71,72]. Causes are Insufficient intake of folic acid during pregnancy, Previous child with spina bifida, Medication such as valproic acid and carbamazepine used to treat epilepsy ,Mother with diabetes[71,73]

**Physiotherapy Method of Spina Bifida:-** Photobiomodulation (PBM) is the implementation of a low intensity light (red and infrared light), such as low-level laser or a light emitting diode (LED), to biological tissues. This phototherapy may achieve its functional effect by the application of monochromatic or narrow-band light in tissues. PBM disturb cell activity through the stimulation or inhibition of chemical and physiological functions. PBM is affected by the wavelength, energy density (fluence), power density, type of injury and absorption spectrum of the photoreceptor. Photons stimulate chemical changes in the interior of the cell, causing biological reactions, triggering neuroprotective responses, improving metabolism and blood flow and reduces inflammatory processes and oxidative stress. PBM along with isotonic contraction of stimulate muscles shows positive impact on motor function. Thus, the combination of physiotherapeutic exercise and PBM is promising treatment for individuals with MMC[75].

**b) Mobility and ambulation enhancing technique:-** Mobility problems in children with spina bifida are common and that differ according to the level of the spine that has been affected during development. A child with a lesion in the lower back is more possibly to be able to independently mobilize than one with a lesion in the upper thoracic spine. The child will require a wheelchair, orthotics or assistive devices. As the child is able to move and ambulate more independently, child may be fitted for braces or splints to detect any deformities caused by muscle imbalance. Orthoses such as braces and splints are supportive devices focus on optimizing existing muscle function and giving support to the child. The earlier the child will be prepared for the upright position required of standing and walking and also enhances normal developmental progression of children with spina bifida lesions in the upper thoracic regions of the spine may require bracing or splinting of the whole leg up to the level of the hip and chest. This is known as a Hip-Knee-Ankle-Foot Orthoses (HKAFO). Reciprocal Gait Orthoses(RGO) may be also provided in order to promote a normal rhythmic walking pattern in the child. Its aims to enhancing the range of motion at a tight joint without the use of surgery. some children may benefit from the use of a wheelchair, as it provides more freedom of movement[76,77].

## CONCLUSION:

This review highlights the current status of physiotherapy methods for overcoming and improving the problems that are arising in pediatric. In conclusion the physiotherapy are able to control and improve the conditions (cerebral palsy, congenital torticollis, spina bifida) in pediatric. The depth analysis reveals that stretching, strengthening exercises was extensively used for regulation of condition. In addition to this physiotherapy treatments provides positive impact for minimizing the symptom and reduce pain during the treatment.

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