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EFFECT OF NEURAL MOBILIZATION IN IMPROVING THE MOTOR AND PHYSICAL FUNCTIONS OF UPPER AND LOWER LIMB IN CHILDREN WITH SPASTIC CEREBRAL PALSY: A REVIEW OF LITERATURE

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Abstract- Background and purpose- Spastic cerebral palsy is the most common type of cerebral palsy which accounts for 77% of all cases of cerebral palsy, Improving muscle strength, ability to walk and improving other physical functions is the main therapeutic goal for children with spastic cerebral palsy. As we know in patients with cerebral palsy. The tone of the muscles is severely affected and the evidences according to the reviewed articles, neural mobilization techniques helps to improve the motor and physical functions of the muscles and helps to decrease disabilities hence neural mobilization can be an effective treatment in improving the motor and physical functions in spastic cerebral palsy patients. **Methods** - Electronic databases such as Google scholar, Pub Med and different sites were used to search literature. The database search identifies 38 articles in which most of the articles fulfill inclusion criteria. Articles were included that have sufficient information related to effect of neural

mobilization in improving the physical and motor functions of both upper and lower limb in patients with spastic cerebral palsy. **Results-** Neural mobilization technique have positive therapeutic effects that helps to facilitate nerve gliding, reduces nerve adherence, improves axoplasmic flow, dispersion of noxious fluid, neural mobilization helps in control of muscle tone, ROM of muscles and helps to maintain spasticity of muscles, and also improve function and QOL. **Conclusion-** Limited literature available on neural mobilization showed that in cp when muscle tone is compromised NM technique can be an effective treatment in improving the muscle tone of upper and lower limb and also helps to improve the physical functions of children with cerebral palsy.

Index terms- Neural mobilization, Spastic cerebral palsy, Motor functions, Physical functions.

I. INTRODUCTION

Cerebral palsy is a group of disorder of development of posture and movement which causes limitations in activities which attributes to non – progressive disturbances that occurs in developing infant/ fetal brain (Franki et.al, 2012). Cerebral palsy is primary considered as the motor disorder with motor signs like spasticity in muscles, muscle weakness, decrease motor control, contractures and bony malformations and also the patient of cerebral palsy have disturbances in sensation, perception, cognition, communication and behavior (S M Braendvik et.al, 2010).

Spastic cerebral palsy is the most common type of cerebral palsy which accounts for 77% of all cases of cerebral palsy in which generally problems occurs like increased muscle tone, hyper -reflexia, exaggerated deep tendon reflexes and clonus can also be seen in such type of patients (Liu et.al, 2021). Cerebral palsy occurs in 2-3% of every 1000 individuals with spastic clinical features so main aim of physical therapy is the management of spasticity in children with cerebral palsy to improve flexibility and movement ability (Kathy Cheng et.al, 2015). Improving muscle strength, ability to walk and improving other physical functions is the main therapeutic goal for children with spastic cerebral palsy (M Ibrahim et.al, 2014). Physical therapy has a major role in treating children with cerebral palsy with including many neuro-developmental techniques, vojta therapy which are based on motor learning principles (Fanki et.al, 2012). Rehabilitation of motor functions in children with cerebral palsy is the fundamental part of treatment which includes the use of conventional physical therapy like physical exercises, stretching of muscles and activities which improve strength, flexibility, gross and fine motor abilities with main aim of improving physical functions and decreasing muscle contractions (Buccino et.al, 2012). Cerebral palsy is a group of disorder of development of posture and movement which

causes limitations in activities which attributes to non – progressive disturbances that occurs in developing infant/ fetal brain (Franki et.al, 2012). Cerebral palsy is primary considered as the motor disorder with motor signs like spasticity in muscles, muscle weakness; decrease motor control, contractures and bony malformations and also the patient of cerebral palsy have disturbances in sensation, perception, cognition, communication and behavior (S M Braendvik et.al, 2010).Spastic cerebral palsy is the most common type of cerebral palsy which accounts for 77% of all cases of cerebral palsy in which generally problems occurs like increased muscle tone, hyper -reflexia, exaggerated deep tendon reflexes and clonus can also be seen in such type of patients (Liu et.al, 2021). Cerebral palsy occurs in 2-3% of every 1000 individuals with spastic clinical features so main aim of physical therapy is the management of spasticity in children with cerebral palsy to improve flexibility and movement ability (Kathy Cheng et.al, 2015).

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affected and the evidences according to the reviewed articles, neural mobilization techniques helps to improve the motor and physical functions of the muscles and helps to decrease disabilities hence neural mobilization can be an effective treatment in improving the motor and physical functions in spastic cerebral palsy patients.

II. Methods-

Study design- Review of literature.

According to our criteria maximum number of article were searched for this review of literature. A total number of 40 articles I found in the study and after editing and filtering of data a total number of 48 articles were included in the study which were both experimental and review of literatures. Articles were included that have sufficient information related to effect of neural mobilization in improving the physical and motor functions of both upper and lower limb in patients with spastic cerebral palsy.

The inclusion criteria will be the articles on neural mobilization techniques effects on improving physical and motor functions of spastic cerebral palsy patients. Articles are included those are published after 2005, in English. All the experimental studies, case studies, review of literature and other types of studies were concluded.

Exclusion criteria were the articles those are published in other languages and data related to study characteristics (i.e. author, year of publication) and copied data were also excluded.

All the articles were searched from Medline, Google Scholar, PubMed, and Science Direct. Data was searched and reviewed by reviewing neural mobilization as an effective treatment in improving the physical and motor functions of upper and lower limb in children with spastic cerebral Palsy.

III. Literature Review-

Cerebral palsy includes a group of disorders of development of posture and movement which causes limitations in activities which attributes to

non- progressive disturbances which occurs in developing brain of fetus/infant with other motor disturbances with problems in sensation, cognition, communication, perception and behavior (Bax M et al., 2005). Cerebral palsy is most common cause of physical disability that is found in early childhood (Kregeloh et al., 2009).Cerebral palsy is recognizable after 3-5 years of age but suggestive signs and symptoms of cp may be present at early age (Gulati S et al., 2018). The incidence of cp is 2-2.5 per 1000 live births (Shankar C et al., 2005).

About 50% cases of cp have no underlying etiology but it can be due to some prenatal, natal and post – natal causes and includes other causes like TORCH infection, trauma, ischemia and others (Jan Mohmmad et al., 2006).Spasticity can be defined as motor disorder which is characterized by velocity dependent exaggeration of stretch reflexes which can result from abnormal intraspinal processes of primary afferent inputs (Sorensen F B et al., 2006). Spasticity includes lesion in UMN which is characterized by over activity of muscles with symptoms like hyper – reflexia, clonus, clasp – knife phenomenon, flexor and extensor spasm, Babinski sign and spastic dystonia (Thibautb A et al., 2013). A most consistent finding in spastic cp is that muscle strength is severely affected with fixed shortening in muscles (Barrett R S et al., 2010).

3.1 CAUSES OF CEREBRAL PALSY- There are no specific causes of cp but abnormalities during pregnancy, conception and delivery can lead to cp, cp includes other causes such as –

- periventricular leukemia (PVL)
- Premature birth followed by intracerebral hemorrhage
- Hydrocephalus
- Hypoxic ischemic encephalopathy
- Infections
- Brain malformations
- Neonatal stroke
- Chromosomal aberrations and sometimes
- Kernicterus (Metz C et al., 2022). Most common cause of SCP (spastic cerebral) is

PWMI (preventicular white matter injury) (Jiang H et al., 2021).

walk, inability to speak, hip displacement, incontinence, behavior or sleep disorder(Novak L et al., 2012), (Shea TM et al., 2008).

3.2 CLINICAL SIGND OF CEREBRAL PALSY –

- Floppiness
- Persistent primitive reflexes
- Delayed development
- Stiffness
- Scissoring of gait
- Early hand dominance (Garfinkle J et al., 2020).

Other co morbidities related with cp includes commonly pain, ID, inability to

Pre conception	Before birth	During birth	After birth
Systemic illness of the mother	Pre mature birth	Premature birth	Hypoxic ischemic encephalopathy
Use of drugs and stimulants	LBW	C – section	Infection
Immune system disorders preceding Pregnancy	CNS malformations	Vacuum – assisted delivery	hyperbilirubinemia
Spontaneous abortions	Maternal DM	Delivery after the due date	Cerebrovascular accidents
Socioeconomic factors	Prolonged rupture of membrane	Prolonged labor	Intracranial hemorrhage
Poisoning	Maternal hemorrhage	Asphyxia	CNS infection
Infections	Multiple gestations	Me conium aspiration	Respiratory distress syndrome
Impaired fertility	Cot win death	Breech vaginal delivery	Artificial respiratory support
Treatment of fertility	Genetic factors	A high fever during delivery	Hypoglycemia neonatal convulsions TBI
	Encephalopathy of prematurity		Near drowning
	Congenital Malformations		meningitis
	Hypoxic – ischemic encephalopathy		
	In vitro fertilization		Prenatal stroke
	Kernicterus		Neonatal encephalopathy
	Maternal disorder of clotting		
	Miconium fetal growth aspiration		
	fetal growth restriction		

Table 1; Risk factors associated with cerebral palsy (Paul S et al., 2022), (Sadowska M et al., 2020), (Upadhyay J et al., 2010), (Morgan C et al., 2018), (Graham D et al. 2017), (Fahey M C et al., 2017).

3.3DIAGNOSIS OF SPASTIC CEREBRAL PALSY-

Early diagnosis of cp include motor signs such as-

- Delayed motor milestones
- Abnormal neurological examination
- Persistent of primitive reflexes
- Abnormal postures (Jones M W et al., 2007).

The diagnosis of SCP is based on identifying the features of movement disorders like-

- Stiff muscles (spasticity)- most common and affects 80% of children with cp
- Dyskinesia
- Ataxia
- Spasticity in cp can be characterized as diplegic, hemiplegic, quadriplegia depending on which limb is affected (Vitrikas K et al., 2020).Neuroimaging studies like MRI, CT scan gives most preferable specificity for identifying intracranial abnormalities in persons with cp (Wu YW et al., 2006).

As NM is a technique that works on physiology of pain by manipulating neural tissue and surrounding non – neural structures and help to restore dynamic

balance between movement of neural tissue and increasing ROM (Martinez FC et al., 2022). Ellis R F et al, found that NM technique have positive therapeutic effects that helps to facilitate nerve gliding, reduces nerve adherence, improve axoplasmic flow, dispersion of noxious fluid. Nery dosSantoss et al, found that NM helps in control of muscle tone muscle tone, ROM of muscles and helps to maintain spasticity of muscles. Zollar J A et al, found that NM improve function and QOL and is the alternative method for treating cp as compared to medicines or invasive methods.

IV. Discussion-

In the present study 38 articles were reviewed. The purpose of the study was to review the effects of neural mobilization in improving the motor and physical functions of upper and lower limb in children with spastic cerebral palsy. Most of the studies favor that neural mobilization techniques helps to reduce the spasticity of muscles in cp patients. Bertolini GR et al., found in his study that neural mobilization techniques helps to gain the normal physiology of nervous system. Richard F Ellis et al., found that neural mobilization techniques is used to treat neurodynamic properties and includes facilitation f nerve gliding, reduction of nerve adherence and helps to improve axoplasmic fluid. Bassoon A et al., found that NM

technique helps to facilitate movement movement between the neural structures and their surrounding with the help of different manual techniques and exercises. Martinez F C et al., found that NM works on physiology of pain by manipulating neural tissue and surrounding non – neural structures and helps to restore dynamic balance between movement of neural tissue and increase ROM. Zollar J A et al., found that NM improves function and QOL in children with cp. Neuro dosSantos AC et al., found that NM helps in control of muscle tone, ROM of muscles and helps to maintain spasticity of muscles. The majority of the studies found that NM techniques helps in improving the nerve and muscle function and thus reduce spasticity of muscles and helps to improve QOL of children with cp.

V. Conclusion-

Literature review of present study concludes that NM helps to reduce spasticity, improves tone, improves axoplasmic fluid, decrease nerve adherence and hence improve muscle function and muscle tone because many articles in my study showing that NM improves physical and motor functions of children suffering with cp. Limited literature available on neural mobilization showed that in cp when muscle tone is compromised NM technique can be a effective treatment in improving the muscle tone of upper and lower limb and also helps to improve the physical functions of children with cerebral palsy.

VI. Limitations-

as there are many effects of NM techniques has been described in the study but the study also have some limitations as no article was found that NM techniques are applied in treatment of cerebral palsy in reducing spasticity of muscles, all studies were done within combination of other physical therapies. Also there is very less number of data is present on effect of NM technique in improving tone and physical functions of SCP.

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