ORIGINAL ARTICLE

ROLE OF STRETCHING EXERCISES IN THE MANAGEMENT OF CONSTIPATION IN SPASTIC CEREBRAL PALSY

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Background: Constipation is considered as one of the most common non-motor manifestations in cerebral palsy (CP). Along with other reasons, spasticity also contributes in developing constipation in CP, by decreasing mobility of trunk and lower extremities and abdominal viscera. Stretching exercises of upper extremities, trunk and lower extremities are routine management of spasticity in CP children. The objective of the study was to determine the role of stretching exercises in improving constipation symptoms in children with spastic cerebral palsy and to explore the association between spasticity and constipation among cerebral palsy children. **Methods:** Single-group Pretest-Posttest Design (Quasi Experimental Study Design). The study was conducted at Physiotherapy Department of National Institute of Rehabilitation Medicine (NIRM) Islamabad. Thirty spastic CP children – both male and female – with complaints of constipation were recruited through non-probability, convenience sampling. The mean age of the children was 7.55±1.33 years. Each child was assessed for defecation frequency (DF), constipation severity by constipation assessment scale (CAS) and level of spasticity by modified ash worth scale for spasticity (MASS) at baseline. Stretching exercises were performed for 30 seconds with five repetitions and at least once a day for six week, followed by positioning of patients in reflex inhibiting posture. Final data was collected using the same tools as done at the baseline. Paired samples t-test was used to analyse the rehabilitation-induced changes after 6 weeks. To determine association between spasticity and constipation Pearson product-moment correlation coefficient was used. The data was analysed through SPSS 20. **Results:** Significant changes, compared to the baseline scores, were observed after 6 weeks of stretching exercises in MASS (2.53±0.62 Vs 1.53±0.77), DF (2.43±0.67 Vs 3.70±1.02) and CAS (7.23±1.50 Vs 5.43±1.73) with $p \leq 0.05$. The results also showed significant correlation between changes in levels of spasticity and severity of constipation ($r = 0.37$; $p=0.04$). Finally, significant correlation was present between improvement in spasticity and defecation frequency ($r = -0.39$; $p=0.02$). **Conclusion:** Stretching exercises administered for the management of spasticity in CP can significantly improve the symptoms of constipation in such children. The results of the study showed that constipation is strongly associated with level of spasticity in CP children.

Keywords: Cerebral palsy; Constipation; Physiotherapy; Spasticity; Stretching exercises.

J Ayub Med Coll Abbottabad 2016;28(4):798–801

INTRODUCTION

Cerebral palsy is non-progressive disorder of central nervous system manifested by impairments in musculoskeletal system. The incidence rate of cerebral palsy (CP) is 2.5/1000 in live births.[1,2] Children with cerebral palsy may have several co-morbidities and are on medical treatment for management of those co-morbidities. The gastrointestinal impairments are much more common in severe neurodevelopmental disorders. In cerebral palsy, one of the most common non-motor problems is constipation. There are various reasons of constipation in cerebral palsy, including hypertonia, malnutrition, mental retardation and lack of mobility. All these factors contribute to reduce the frequency of defecation and stool consistency ultimately leading to psychological and socioeconomically reduced quality of life of child and parents.[3,5] The prevalence of constipation among CP children is 74%. The normal frequency of defecation in healthy children is usually three to four times as compared to children with cerebral palsy where the frequency reduced to once a week or once in 10 days.[3,4,5] In CP children, spasticity may be aggravated by stomach pain due to muscle cramps and unsuccessful defecation that lead to chronic constipation and vice versa.[6,7]

Several methods, both pharmacological and non-pharmacological, are available for the management of constipation in children with spastic CP. These include enough fluid intakes, use of fibre diet, biofeedback, use of oral laxatives, and rectal stimulants.[8] Some children are on oral medication and most of the children require enemas to facilitate defecation. Medications have their own side effects and enema is a painful procedure which may affect such children and concerned caregivers psychologically.[9]

Physical therapy is an integral part of non-pharmacological management of CP. The aim of physical therapy in such cases is to reduce spasticity, improve joint mobility, and enhance functional independence.[10] There is a paucity of literature regarding the role of physical therapy in the relief of constipation in children with CP. Some studies suggested that

Improvement in spasticity, rang of motion ROM and mobility contribute in relieving constipation in cerebral palsy children.[9] The stretching of hypertonic muscles of lower limb, back and trunk and strength training of abdominal muscles and positioning of patients in Reflex inhibiting posture may improve constipation along with motor improvement.[6,7,11] Stretching of trunk and lower extremity muscles induces parasympathetic stimulation due to which the motility of gut is increased. The increase in motility of gut aids in the process of defecation and constipation is relieved.[11] To the best of authors' knowledge, there is no published study investigating the role of stretching exercises in the management of constipation in spastic CP children. Therefore, the purpose of the present study was to determine the effectiveness of stretching exercises to relieve constipation in children with spastic cerebral palsy. Additionally, the aim was to explore the association between spasticity and constipation.

This study was conducted to determine the effectiveness of Stretching exercises to relieve constipation in children with spastic cerebral palsy. It was hypothesized that stretching exercises would significantly improve constipation in spastic CP and there would be was strong correlation between changes in levels of spasticity and constipation.

MATERIAL AND METHODS

The One-Group Pretest-Posttest Design (Quasi Experimental Study Design) was conducted in Physiotherapy Department of National Institute of Rehabilitation Medicine (NIRM) Islamabad after approval from ethical review board. Thirty subjects both male n=19 (63.3%) and female n=11 (36.7%) with complaints of constipation were recruited in the study. The subjects were recruited through convenience sampling technique. All other types of CP were excluded.

After taking written, informed consent from the parents demographic data was collected in term of age, gender, cerebral palsy (CP) Type and gross motor functional classification scale GMFCS. Each child was assessed for defecation frequency, constipation severity by constipation assessment scale (CAS) and spasticity by (modified ash worth scale for spasticity (MASS).

Each child was given 40 minutes during each session. The session included stretching exercises of the following muscle groups; Calf, Hamstrings, adductors of thigh, hip flexors, lumbar extensor, trunk rotators and upper extremity. Each stretch was performed for 30 seconds with five to ten repetitions and at least once a day, followed by positioning of patients in reflex inhibiting posture (Table-1). First Session was given by the therapist in physiotherapy department of NIRM, Islamabad and remaining session was given at home by caregivers. Follow up with the patients and their parents were conducted once a week.

After the completion of the 6-week stretching rehabilitation, final data was collected using the same tools as done at the baseline.

Paired samples *t*-test was used to analyse effects of stretching exercise regimen on the symptoms of constipation. In order to determine the association between variables, the Pearson product-moment correlation coefficient was used. The data was analysed through SPSS 20. The level of significance was set at p value less than 0.05.

RESULTS

The mean age of subjects was 7.55±1.33. Total n=20 (66.7%) quadriplegic, n=9 (30%) were diplegic and n=1 (3.3%) subject was hemiplegic. The functional status of spastic CP on GMFCS was level IV (n=22), level V (n=6), level III (n=1) and level II (n=1). (Table-2)

The baseline values (mean±SD) of MASS, DF and CAS were 2.53±0.62, 2.43±0.67 and 7.23±1.50 respectively. After 6 weeks of stretching intervention, significant improvement was observed in MASS score (2.53±0.62 Vs 1.53±0.77; $p \leq 0.05$). Similarly, defecation frequency improved significantly after intervention (2.43±0.67 Vs 3.70±1.02; $p \leq 0.05$). Severity of constipation was also significantly reduced due to stretching intervention (7.23±1.50 Vs 5.43±1.73; $p \leq 0.05$) (Figure-1).

There was low and negative (r = -0.20) correlation observed between changes in values of constipation severity and defecation frequency but it was statistically non-significant (p=0.27). Similarly, the association between changes in levels of spasticity and defecation frequency was also negative (r = -0.39; p=0.02). On the other hand, changes in levels of spasticity and severity of constipation was medium and positive (r = 0.37; p=0.04) (Table-3)

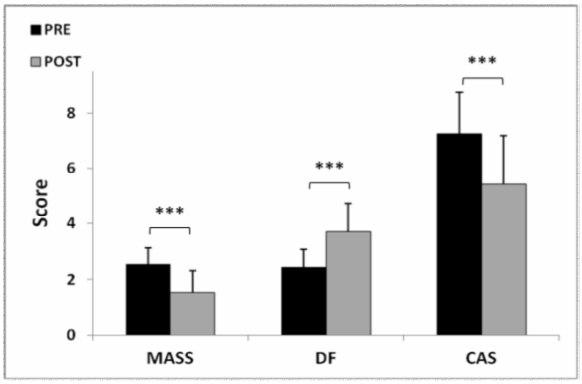

Figure-1: Changes in different variables after 6-week stretching rehabilitation (MASS = modified ashworth scale for spasticity; DF = defecation frequency; CAS = constipation assessment scale)
***indicates significant rehabilitation-induced change ($p \leq 0.001$)

Table-1: Stretching Exercises Protocol

	Calf	Hamstring	Hip Adductors	Hip Flexors	Back Extensors	Trunk Rotators	Upper Extremity
Frequency of sessions	7 days/week						
Duration of intervention	42 session in 6 weeks						
Repetitions of stretches in each session	5–10 Repetition/per session						
Duration of each stretch	30 sec						

Table-2: Subjects Demographics (n=30)

		Mean/N	SD/%
Age		7.55	1.33
Gender	Male	19	63.3
	Female	11	36.7
Type of CP	Quadriplegic CP	20	66.7
	Diplegic CP	9	30
	Hemiplegic CP	1	3.3
GMFCS	Level V	6	20
	Level IV	22	73.3
	Level III	1	3.3
	Level II	1	3.3

Table-3: Relationship between Variables (n=30)

	r	*p*-value
CAS & DF	-0.20	0.27
MASS & DF	-0.39	0.02
MASS & CAS	0.37	0.04

DISCUSSION

The main aim of the current study was to determine the effectiveness of stretching exercises in relieving constipation in children with CP. The findings of the study have shown that stretching exercises greatly improve the symptoms of constipation in cerebral palsy children ($p \leq 0.05$). This is in accordance to our first hypothesis that stretching rehabilitation will significantly improve constipation spastic cerebral palsy children. The current study showed association between improvement in spasticity and constipation. These findings confirm our second hypothesis that there would be significant correlation between spasticity and constipation.

Smooth functioning of the gastrointestinal tract (GIT) engage complex mechanisms involving the CNS, autonomic nervous system and enteric nervous system.[12] Coordinated relaxation and contraction of several muscles of GIT system lead to an efficient and coordinated defecation. In Cerebral Palsy which is an upper motor neuron disease, the normal interaction of these systems is affected and as a result there is altered intestinal motility.[13] The parasympathetic autonomic supply to the gut changes due to CNS involvement leading to decreased gut motility, slower colonic transit and consequently constipation.[14,15] Another reason for constipation in CP is the lack of mobility of children; their body movements are restricted due to spastic muscles which hampers the movement of visceral organs as well.[3,6,7]

As a part of physiotherapy, stretching exercises are aimed to reduce spasticity and improve mobility.[10] The stretching exercises of lower extremities and trunk muscles in spastic CP also facilitate the defecation by activation of parasympathetic stimulation and mechanical effect on propulsion of faecal content towards rectum.[11]

Stretching exercises of spine extensors and trunk rotators help in the process of defecation. The defecation process involves propulsion of stools through rectum. During stretching of back extensors and trunk rotator exercise, hip is pressed against the abdomen which also puts pressure on the abdominal contents and help in pushing stools caudally towards rectum.[15]

Colon terminates into rectum which becomes anal canal after passing through the levator ani muscles. Ninty degree angle is formed at the junction of anal canal and the rectum. This junction straightens when hip is flexed so flexion of hip helps in the process of defecation and stools are excreted easily. The muscles of trunk and lower limbs are supplied by lumbo-sacral plexuses, similar nerve roots supply to the muscles of hind gut. Stretching of these muscles induces parasympathetic stimulation due to which the motility of gut is increased. The increase in motility of gut aids in the process of defecation and thereby relieves constipation.[16]

The current study showed that there is strong correlation between improvement in spasticity and constipation symptoms. Several studies have been reported in the literature regarding the effective management for constipation in cerebral palsy.[6,7,11]

Previously Shaheen and Awan[6], in a case study had demonstrated the role of stretching exercises in relieving constipation among cerebral palsy children by reducing spasticity.

Similarly, another pilot study has shown promise for the role of non-pharmacological treatments, like osteopathy in the management of constipation in CP children.[7] Most of the patients in the present study rated IV and V on the GMFCS signifying severely reduced mobility and functional status.

The results of the present study showed that stretching exercises improved defecation frequency and constipation severity significantly, but association between DF and CAS was less significant. One possible explanation to this finding could be the absence of potential link between stretching and severity of constipation. Although exercises could influence defecation frequency, severity of constipation, on the other hand, is more affected by dietary and nutritional factors.[17] It was also reported that after stretching exercises if child in lying on left side defecation occurred more frequently then right side lying exact underlying mechanism is not clearly understood. One possible reason could be an increased mechanical

pressure on the hind gut associated with left-side position resulting in better defecation. Stretching exercises are easy techniques to learn by the peers. So they can apply the technique by their own and reduce their financial burden. As constipation improves use of oral/rectal laxative may decreases so side effect medication and painful procedures like enema may be avoided.

CONCLUSIONS

Stretching exercises administered for the management of spasticity in CP can significantly improve the symptoms of constipation in such children. The results of the study showed that constipation was also associated with level of spasticity in CP children, so management of spasticity can significantly improve the symptoms of constipation. But on the other hand, constipation severity had less significant association with defecation frequency may be due to dietary status.

One of the limitations of the current study was absence of documentation of nutritional/dietary and fluid intake of the patients during the study period. Furthermore, this study was designed to be a single group study, without any control group which may have compromised the quality of the trial. Therefore, it is suggested that future study should be conducted with control or comparison group with appropriate sample size. Stretching exercises are easy to learn but effectiveness is depending on successful interventions by parents or caregivers. So it is recommended parent/care giver must be properly trained before application of stretching exercises to the CP.

AUTHORS' CONTRIBUTION

WAA: Conception and design of the work, analysis and interpretation of data, revising it critically and Final approval of the article to be published, accountable for all aspects of the work. TM: Conception and design of the work, analysis and interpretation of data, revising it critically and Final approval of the article to be published, accountable for all aspects of the work.

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Received: 27 November,2016	*Revised: -*	*Accepted: 2 December, 2016*

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