

RESEARCH ARTICLE

PREVALENCE AND RISK FACTORS ASSOCIATED WITH CONSTIPATION CEREBRAL PALSY CHILDREN IN PAKISTAN

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ABSTRACT

Objective: To find prevalence of constipation and associated risk factors among cerebral palsy. **Material & Methods:** The Cross sectional and case control study was conducted in physiotherapy department of National Institute of Rehabilitation Medicine Islamabad (NIRM) after approval from director of NIRM. The inclusion criteria were CP children with age between 2-12 years and Children with any other systemic co morbidities, physical deformity in GIT, intellectual disability and recent traumatic brain injury were excluded. A total of n=170 subjects fulfilled the inclusion criteria and were part of the study. The data was collected in term of age, gender, body mass index (BMI), types of CP children, fluid, fiber and calories intake. Spasticity and functional independence were also measured through *Modified Ashworth scale (MAS)* and Gross Motor Function Classification System (GMFCS) respectively. The constipation in CP children was measure through defecation frequency. *Defecation frequency* measured less than three times a week was considered constipation and Constipation assessment scale (CAS). The data was described in the form of frequency, percentage, mean, standard deviation, correlation, chi-square and p-value. **Results:** The results showed that all characteristics including age, spasticity, functional independence, fluid intake, calories intake, fiber intake, physiological and topographical type of CP children showed significant association ($p<0.05$) with defecation frequency and constipation severity except BMI and gender ($p\geq 0.05$). **Conclusion:** Constipation is highly prevalent in cerebral palsy. The early age, increased spasticity, decreased functional independence related to increased constipation CP children. It was also concluded that low fluid, calories and fiber intake were also contributing factor in development of constipation. The children with spastic cerebral palsy and quadriplegia are more related to constipation than other kind of cerebral palsy.

Keywords: Cerebral palsy, constipation, constipation severity scale, defecation frequency, modified ashworth scale, gross motor functional classification scale.

INTRODUCTION

Cerebral palsy is a permanent non-progressive disorder of developing (immature) brain manifested by impairment in movement and posture that result in activity limitation.^{1, 2} Prevalence of cerebral palsy is about 2/1000.²⁻⁴ There are many co morbidities associated with cerebral palsy that include hearing impairment, visual deficit, epilepsy, feeding disorders.⁵⁻⁷ Constipation is one of the most common gastrointestinal impairment in neurological diseases including CP.^{8, 9} It is defined as two or fewer bowel movements per week.^{10, 11} It can also be defined as irregular or hard stool and more pressure during defecation, taking more time to defecate and feeling of incomplete defecation. Its prevalence ranges from 26% to 62% in CP child while in normal children its prevalence is about 0.3%-37%.¹² Reasons of constipation in children with CP embrace lack of mobility, increased muscular tone, and malnutrition due to less intake of food secondary to feeding abnormalities.¹²⁻¹⁴ The normal functioning of gastrointestinal tract required co-ordination between autonomic nervous system, enteric nervous system and central nervous system. The process of defecation takes place as a result of rhythmic relaxation and contraction of various muscles of gastrointestinal tract. This coordinated action of GIT muscles become impaired in neurological disorders like cerebral palsy. Hyper stimulation of PNS results

in decreased intestinal motility that consequently increases colonic transit time and ultimately constipation occurs. In cerebral palsy, the reason for decreased movement of gut is because of spasticity.¹⁵

The constipation may become worsen because of severity of the disease, usage of medicines for decreasing the muscle tone and controlling fits, mental retardation and immobility. QOL of these children is affected by constipation and make them socially restricted.¹⁶⁻¹⁸

Constipation in these children can be treated by many ways. Many medicines are used for preventing and treating constipation in children with cerebral palsy. Drug laxatives are most commonly used that act by increasing intestinal motility.¹⁹ Fiber intake along with fluid intake is more effective in treating constipation than fiber alone.²⁰ Physical therapy including stretching exercises also plays an important role in management of constipation among CP child. Stretching exercises are performed for decreasing muscle tone in spastic cerebral palsy.^{13, 21} In the literature there is limited evidence available on risk factors of constipation in children with cerebral palsy. After having knowledge about these risk factors, it is possible to avoid them and make CP children free from constipation in order to enhance quality of their lives. So the purpose of this

study was to find prevalence of constipation and its associated risk factors among cerebral palsy.

MATERIALS AND METHODS

The Cross sectional and case control study was conducted in physiotherapy department of National Institute of Rehabilitation Medicine Islamabad (NIRM) after approval from director of NIRM. The inclusion criteria were CP children with age between 2-12 years and Children with any other systemic comorbidities, physical deformity in GIT, intellectual disability and recent traumatic brain injury were excluded.

A total n=233 subjects were evaluated for eligibility and n=63 subjects were excluded from the study due to not meeting inclusion criteria. A total of n=170 subjects fulfilled the inclusion criteria and were part of the study. The approval of the study was granted by Director National Institute of Rehabilitation Medicine (NIRM) Islamabad. Prior to data collection written informed consent was obtained from the parents of CP children.

The data was collected in term of age, gender, body mass index (BMI), types of CP children, fluid, fiber and calories intake. Spasticity and functional independence were also measured through *Modified Ashworth scale (MAS)* and Gross Motor Function Classification System (GMFCS) respectively. The constipation in CP children was measure through defecation frequency. *Defecation frequency* measured less than three times a week was considered constipation and measured by nominal scale 1= twice a month, 2= once a week, 3= twice a week and 4= daily. Constipation severity was measured with 8 items Constipation assessment scale (0-16 scale, 0=no constipation, 1-8=some, 9-16= severe constipation). The constipation was diagnosed on the basis of both defecation frequency and constipation severity on constipation assessment scale. The data was described in the form of frequency, percentage, mean, standard deviation, correlation, chi-square and p-value.

RESULTS

The mean±SD age of subjects was 63.7±31.58 months, height was 107.5±25.79 cm, weight was 17.07±7.89 kg and BMI was 14.35±2.99 kg/m². The mean±SD spasticity of upper extremity on modified Ashworth scale (MAS) was 0.51± 0.66, spasticity of lower extremity on modified Ashworth scale (MAS) was 1.56 ± 0.788 and functional independence on gross motor function classification system (GMFCS) was 3.27 ±1.44. Total number of male and female were n=107(62.94%) and n=63(37.06%) respectively. The frequency of constipation in CP children was n=69(40.59%). Figure 1

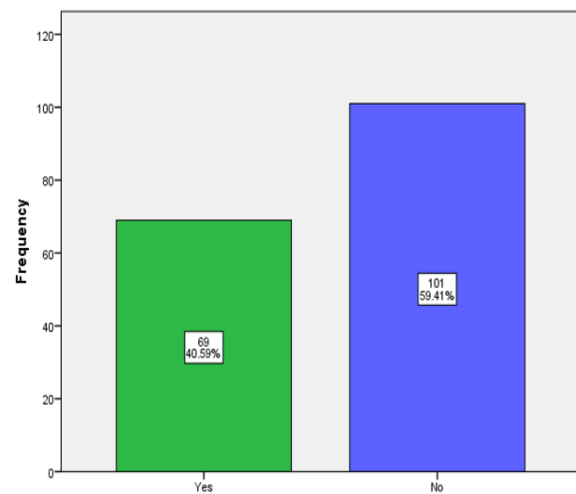


Figure 1: Frequency of Constipation CP children.

The results showed that all characteristics including age, spasticity, functional independence, fluid intake, calories intake, fiber intake, physiological and topographical type of CP children showed significant association ($p < 0.05$) with defecation frequency and constipation severity except BMI and gender ($p \geq 0.05$). The detail of association between basic characteristics of study participant with constipation can be seen in table 1&2.

Table 1: correlation between quantitative variables

		Defecation Frequency (3.15±1.2)		Constipation severity - CAS(1.88±2.60)	
		r	p-value	r	p-value
Age (months)	63.7±31.58	0.199	0.009	-0.270	<0.001*
Body Mass Index (kg/m2)	14.35±2.99	-0.085	0.271	0.133	0.084
Modified Ashworth Scale for Spasticity (UL)	0.51± 0.66	-0.522	<0.001	0.530	<0.001*
Modified Ashworth Scale for Spasticity (LL)	1.56 ± 0.788	-.354	<0.001	0.327	<0.001*
GMFCS	3.27 ±1.44	-0.546	<0.001	0.557	<0.001*
Fluid Intake (ml)	702.9±267.64	0.326	<0.001	-0.307	<0.001*
Calories Intake (Kcal)	562.52±222.45	0.100	0.193	-0.206	0.007*
Fibre Intake (gm)	8.37±5.5	0.159	0.039	-0.228	0.003*

*Level of significance <0.001

Table 2: correlation between qualitative variables

		Defecation Frequency				χ ²	p-value	Constipation Severity (CAS)			χ ²	p-value
		Twice a Month	Once a week	Twice a week	Daily			None (0)	Some (1-8)	Severe (9-16)		
Gender	Male	12(7.1)	26(15.3)	2(1.2)	67(39.4)	5.24	0.155	67(39.4)	39(22.9)	1(0.6)	1.43	0.488
	Female	6(3.5)	15(8.8)	6(3.5)	36(21.2)			36(21.2)	25(14.7)	2(1.2)		
Type of CP	Spastic	17(10)	38(22.4)	5(2.9)	89(52.4)	29.83	<0.001*	89(52.4)	59(34.7)	1(0.6)	50.54	<0.001*
	Ataxic	0(0)	1(0.6)	0(0)	12(7.1)			12(7.1)	1(0.6)	0(0)		
	Dyskinetic	0(0)	2(1.2)	2(1.2)	1(0.6)			1(0.6)	2(1.2)	2(1.2)		
	Mixed	1(0.6)	0(0)	1(0.6)	1(0.6)			1(0.6)	2(1.2)	0(0)		
Type of CP (Topographic)	Diplegia	10(10.6)	13(13.8)	2(2.1)	69(73.4)	35.55	<0.001*	69(73.4)	25(26.6)	0(0)	29.87	<0.001*
	Hemiplegia	2(11.8)	0(0)	1(12.5)	14(82.4)			14(82.4)	3(1.6)	0(0)		
	Quadriplegia	6(10.2)	28(47.4)	5(8.5)	20(33.9)			20(33.9)	36(61)	3(5.1)		

*Level of significance <0.001

DISCUSSION

The primary objective was to find prevalence of constipation and associated risk factors among cerebral palsy. The study showed that prevalence of constipation was about 40.59% among all types of cerebral palsy children. According to a previous study, 74% children with CP were having constipation and most of them were quadriplegic.²²

The frequency of defecation was about 1 in 10 days in children with cerebral palsy which was lower than the frequency among normal children which was 3-4 days in a week.¹⁸

In current study, in gender vice comparison, prevalence of constipation was 39.3% in males while in females it was about 42.9%, but the effect of gender in prevalence of constipation was insignificant ($p \geq 0.05$). Similar study was conducted by Mustafa Inan et al in which he found factors associated with childhood constipation in normal population. The prevalence was found to be 7.2% with no significant difference ($p < 0.05$) between males (7.3%) and females (7.2%).²³ The reason for this big difference is because in normal population

the activity level, dietary intake, fluid intakes, muscular tone, coordination between voluntary and involuntary muscles of defecation were normal.

In current study, age was found to be positively associated ($r=0.199$, $P < 0.05$) with defecation frequency and negatively associated ($r=-0.270$, $P < 0.05$) with constipation severity. Similar study was conducted by Rebekka Veugelers et al which showed insignificant association of age and constipation. Decreased activity level and inadequate intake of fiber and fluid contributes in higher prevalence of constipation during early age.²²

62 out of 150(41.3%) spastic CP child, 1 out of 13(7.7%) ataxic, 4 out of 5 (80%) dyskinetic while 2 out of 2(100%) mixed CP had constipation. Topographically, prevalence of constipation among quadriplegics was about 67.8% while among diplegics and hemiplegics it was 27.7% and 17.6% respectively. As the defecation frequency is affected by exercises,²⁴ decreased activity status is a contributing factor for higher prevalence of constipation among quadriplegic patients. Increased muscular tone in spastic cerebral palsy leads to

decreased ambulatory status which is responsible for higher prevalence of constipation among them.¹⁷ Lower extremity and trunk motility stimulate parasympathetic activity in colon and puts a mechanical effect by contraction of abdominal muscles that moves fecal material towards rectum and thus facilitate the process of defecation.^{25,13}

Current study showed significant ($p < 0.001$) but negative correlation ($r = -0.52$ U/E, $r = -0.354$ L/E) between spasticity and defecation frequency. Significant ($p < 0.001$) and positive association ($r = .530$ U/E, $r = .327$ L/E) was found between severity level of constipation (CAS) and level of spasticity (MASS). According to a previous study by Awan WA et al on role of stretching exercises in management of constipation in spastic cerebral palsy, spasticity was found to be correlated significantly with constipation.¹³ Another study conducted by Awan et al, reported that spasticity significantly reduce defecation frequency among CP children.²⁶ Spasticity contributes in colonic transit time delay and thus decreases defecation frequency. Lack of mobility due to spasticity in smooth muscles and altered motor activity in anal sphincter muscle contributes in causing fecal retention and delay in colonic transit time.¹⁷ The anorectal angle is formed at the junction of rectum and anal canal which is 90 degree and increases during squat position of defecation. Spasticity in pelvic floor muscles does not allow this angle to be increased during defecation and thus decreases defecation frequency.²⁸⁻²⁹

According to the body mass index, 36 out of 81(44.4%) underweight participants of the current study, 20 out of 70(28.6%) normal weight participants, 3 out of 6(50%) overweight participants and 10 out of 13(76.9%) obese participants had constipation. Poor nutrition contributes significantly in poor growth among children with cerebral palsy. Oral motor dysfunction is one of the major factor responsible for causing malnutrition.^{29, 30} Similarly another study has seen obesity and over nutrition common among CP children. BMI > 25 has observed to be higher among disable people than people without disabilities.³⁰

In current study, participants who were taking more fluid, fiber and calories had higher frequency of defecation and lower severity level of constipation and vice versa. There was significant ($p < 0.05$) and positive association of defecation frequency with fluid intake($r = 0.326$), fiber intake($r = 0.100$) and calories intake($r = 0.159$) while negative correlation was seen with severity of constipation ($r = -0.307$, -0.228 , -0.206 for fluid fiber and calories intake respectively). Abnormal feeding behavior, oral motor dysfunction, difficulty in swallowing is one of the major complications in children with cerebral palsy. This contributes in less intake of food and ultimately mal-nutrition among them.³¹ Adequate intake of fiber is important as it enhances laxation of fecal waste and prevents constipation.³²

In current study, about 29 (17.1%) out of 170 participants were at level I of GMFCS, 24(14.1%) out of 170 were at level II, 36(21.2%) out of 170 were at level III, 33(19.4%) out of 170 were at level IV while 48(28.2%) out of 170 were at level V of GMFCS. Prevalence of constipation was highest among level IV (19 out of 33) and level V (41 out of 48). A less GMFCS level indicates increased ambulatory status of children and vice versa. Lack of mobility is one of the major cause of constipation.¹³ In one study by Eun Sook Park et al¹⁷ delay in colonic transit time was observed among cerebral palsy children. Results showed that there was significant association ($p < 0.05$) of colonic transit time and constipation with ambulatory function.

CONCLUSION

The study indicated that Constipation is highly prevalent in cerebral palsy. The early age, increased spasticity, decreased functional independence related to increased constipation CP children. It was also concluded that low fluid, calories and fiber intake were also contributing factor in development of constipation. The children with spastic cerebral palsy and quadriplegia are more related to constipation than other kind of cerebral palsy. The current study has very low sample size and weak methodology in establishing relationship between mentioned characteristics and constipation. It was

suggested that case control study with individual variables should be conducted to find magnitude of relationship with constipation. It was also suggested that a randomized control trail should be conducted with fluid and dietary interventions to find actual cause and effect relationship with constipation severity and defecation frequency in CP children.

REFERENCES

- Rosenbaum P, Paneth N, Leviton A, Goldstein M, Bax M, Damiano D et al. A report: the definition and classification of cerebral palsy April 2006. *Dev Med Child Neurol Suppl.* 2007;109:8-14.
- Krigger, K.W. Cerebral palsy: an overview. *American family physician.* 2006;73(1):91-100.
- Graham, H.K. and P. Selber, Musculoskeletal aspects of cerebral palsy. *J Bone Joint Surg Br.* 2003;85(2):157-66.
- Gilbert, W.M., et al., Adverse obstetric events are associated with significant risk of cerebral palsy. *Am J Obstet Gynecol.* 2010;203(4):328.e1-5
- Venkateswaran, S, M.I. Shevell. Comorbidities and clinical determinants of outcome in children with spastic quadriplegic cerebral palsy. *Dev Med Child Neurol.* 2008;50(3):216-22.
- Low JA, Galbraith RS, Muir DW, Killen HL, Pater EA, Karchmar EJ. Factors associated with motor and cognitive deficits in children after intrapartum fetal hypoxia. *Am J Obstet Gynecol.* 1984;148(5):533-9.
- Hou M1, Fu P, Zhao JH, Lan K, Zhang H. Oral motor dysfunction, feeding problems and nutritional status in children with cerebral palsy. *Zhonghua Er Ke Za Zhi.* 2004;42(10):765-8.
- Jones MW, Morgan E, Shelton JE, Thorogood C. Cerebral palsy: introduction and diagnosis (part I). *J Pediatr Health Care.* 2007;21(3):146-52.
- Del Giudice E, Staiano A, Capano G, Romano A, Florimonte L, Miele E, et al. Gastrointestinal manifestations in children with cerebral palsy. *Brain Dev.* 1999;21(5):307-11.
- Biggs, W.S. and Dery, W.H. Evaluation and treatment of constipation in infants and children. *Am Fam Physician.* 2006; 73: 469–477
- Chao HC1, Chen SY, Chen CC, Chang KW, Kong MS, Lai MW, et al. The impact of constipation on growth in children. *Pediatr Res.* 2008;64(3):308-11
- Penagini F, Mameli C, Fabiano V, Brunetti D, Dilillo D, Zuccotti GV. Dietary Intakes and Nutritional Issues in Neurologically Impaired Children. *Nutrients.* 2015;7(11):9400–9415.
- Awan WA, Masood T. Role Of Stretching Exercises In The Management Of Constipation In Spastic Cerebral Palsy. *J Ayub Med Coll Abbottabad.* 2016;28(4):798-801.
- Campanozzi A, Capano G, Miele E, Romano A, Scuccimarra G, Del Giudice E, et al. Impact of malnutrition on gastrointestinal disorders and gross motor abilities in children with cerebral palsy. *Brain Dev.* 2007;29(1):25-9.
- Furness, J.B., The enteric nervous system: normal functions and enteric neuropathies. *Neurogastroenterol Motil.* 2008;20 Suppl 1:32-8
- Veugelers R.J.G. A Population-Based Study on Comorbidity in Children with Severe Motor and Intellectual Disabilities: Focus on Feasibility and Prevalence [Internet]. Erasmus University Rotterdam; 2006. Available from: <http://hdl.handle.net/1765/8118>
- Park ES, P.C., Cho SR, Na SI, Cho YS., Colonic transit time and constipation in children with spastic cerebral palsy. *Arch Phys Med Rehabil.* 2004;85(3):453-6.
- Sullivan PB. Gastrointestinal disorders in children with neurodevelopmental disabilities. *Dev Disabil Res Rev.* 2008;14(2):128-36.
- Norton C, Chelvanayagam S. Bowel problems and coping strategies in people with multiple sclerosis. *Br J Nurs.* 2010;19(4):220-6.
- Staiano A1, Simeone D, Del Giudice E, Miele E, Tozzi A, Toraldo C. Effect of the dietary fiber glucomannan on chronic constipation in neurologically impaired children. *J Pediatr.* 2000;136(1):41-5.
- Morisawa T, Takahashi T, Nishi S. Effects of passive lower limb and trunk exercises and diaphragm breathing exercise on intestinal movement. *J Phys Ther Sci* 2013;25(1):117–9.
- Veugelers R, Benninga MA, Calis EA, Willemsen SP, Evenhuis H, Tibboel D et al. Prevalence and clinical presentation of constipation in children with severe generalized cerebral palsy. *Dev Med Child Neurol.* 2010;52(9):e216-21.
- Inan M, Aydiner CY, Tokuc B, Aksu B, Ayvaz S, Ayhan S et al. Factors associated with childhood constipation. *J Paediatr Child Health.* 2007;43(10):700-6.
- Sullivan PB, Lambert B, Rose M, Ford-Adams M, Johnson A, Griffiths P. Prevalence and severity of feeding and nutritional problems in children with neurological impairment: Oxford Feeding Study. *Dev Med Child Neurol.* 2000;42(10):674-80.
- Knowles CH, Martin JE. Slow transit constipation: a model of human gut dysmotility. Review of possible aetiologies. *Neurogastroenterol Motil.* 2000;12(2):181–196.
- Awan, W.A., T. Masood, and R. Kanwal, Nutritional status and its association with constipation in spastic cerebral palsy. *Pak J Physiol.* 2019;15(2):66-71.
- Kuijpers HC, Bleijenberg G. The spastic pelvic floor syndrome. A cause of constipation. *Dis Colon Rectum.* 1985;28(9):669–672..
- Fung EB, Samson-Fang L, Stallings VA, et al. Feeding dysfunction is associated with poor growth and health status in children with cerebral palsy. *J Am Diet Assoc.* 2002;102(3):361–373.
- Kuperminc MN, Stevenson RD. Growth and nutrition disorders in children with cerebral palsy. *Dev Disabil Res Rev.* 2008;14(2):137–146.
- Rimmer JH, Wang E. Obesity prevalence among a group of Chicago residents with disabilities. *Arch Phys Med Rehabil.* 2005;86(7):1461–1464.
- Lopes PA, Amancio OM, Araújo RF, Vitalle MS, Braga JA. Food pattern and nutritional status of children with cerebral palsy. *Rev Paul Pediatr.* 2013;31(3):344–349.
- Williams CL, Bollella M, Wynder EL. A new recommendation for dietary fiber in childhood. *Pediatrics.* 1995;96(5 Pt 2):985–988.

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