

Investigation of feeding problems in children with cerebral palsy

Abstract

Introduction: Eating and swallowing are important for child health and play an essential role in her/his physical, social, emotional and cultural development. In children with cerebral palsy because of neuromuscular disorders, there is high prevalence of feeding and swallowing disorders. Early diagnosis, prevention and management of feeding problems are important process. In this study, feeding problems in different types of cerebral palsy were investigated.

Materials and methods: In this cross-sectional descriptive study, 60 children with cerebral palsy that referred to clinical centers were selected using random sampling. Feeding and swallowing skills of these children were investigated with using of Pediatric assessment scale for severe feeding problems.

Results: Findings indicated that children with spastic and flaccid cerebral palsy have feeding problems with similar severity. Also children with athetoid cerebral palsy showed lowest severity of feeding problems.

Conclusion: Swallowing performance and proper feeding skills plays an important role in children's development. Given the high prevalence of feeding problems in children with cerebral palsy, early diagnosis and intervention should be done to prevent of secondary problems.

Keywords: cerebral palsy, feeding skills, swallowing

Volume 11 Issue 1 - 2019

Farhad Sakhaei,¹ Golnoosh Golmohamadi,¹ Mohamad Rezaei²

¹University of Social Welfare and Rehabilitation Science, Iran

²Faculty of Rehabilitation Sciences, Hamadan University of Medical Sciences and Health Services, Iran

Correspondence: Farhad Sakhai, University of Social Welfare and Rehabilitation Science, Tehran, Iran, Tel 0098912809589, Email farhast9@gmail.com

Received: December 12, 2018 | **Published:** February 05, 2019

Introduction

Normal development of sucking, swallowing and chewing require the correct oral skills, as well as coordination of voluntary and involuntary movements of oro-facial and tongue muscles.¹ In children with cerebral palsy, normal functioning of this group of muscles is impaired in a variety of ways.^{2,3} Abnormal tension and movement of the tongue, throat and palate, as well as sensory defects in these areas may lead to strangulation, as well as prevent swallow of saliva and thus cause drooling in these children.⁴ The two-sided impairment of the upper motor neuron also usually causes swallowing disorder, which involves problems in the formation of food morsel and delays in the transfer the solid and liquid food from the oral cavity to the digestive tract.⁵

The swallow function is divided to the voluntary oral stage and the pharyngeal stages and involuntary esophagus.⁶ Oral stage is performed by coordinated movements of the mouth, throat and larynx. Chewing a morsel, prepare it for transfer to the throat and esophagus. This process also requires adequate saliva secretion, oral-pharyngeal mucosal layers, and neuro-muscular coordination, which is controlled voluntarily by the cranial nerves 5, 7 and 12. When the food reaches the posterior throat, the pharyngeal stage begins and immediately a sensory message is sent to the swallowing center in medulla oblongata and a coordinated response is returned. The efferent messages, which are cholinergic stimuli, transmit impulses to the upper throat and esophagus through various cranial nerves (e.g., 5, 9 and 10).⁷ The third stage of swallowing (esophageal) that is an involuntary reflex, with the relaxation of the lower esophageal sphincter and the successive constrictions of the muscle of the body of the esophagus, morsel is pushed along the esophagus to the stomach.⁸ The oral and pharyngeal abnormalities of the swallowing process result in the patient's inability to form a mouthful of food and move it to the throat, resulting in the presence of food in the mouth.⁹ Abnormalities in the second stage of swallowing cause to delay in transmission the fluid and food in the

lower larynx, which is associated with coughing, choking, returning food from the nose (causing choking, producing tears and sneezing), or vomiting; initial symptoms this condition is a feeling of itching in the throat and dry cough during mealtime.¹⁰

Another problem in children with swallowing disorder is excessive sensation in the oral area and oral mucosa that causes vomiting and severe choking when eating solid foods.⁴ Some movements and muscles related to the function of swallowing, speech, as well as neural networks related to the high level control of these motor functions is same,^{11,12} which is why, in most children with cerebral palsy, in addition to swallowing problems, a speech dysarthria is also seen.¹³ According to Rezaei et al., Nutritional skills disorder that also show the sensory-motor and muscle tone deficits is common in children with cerebral palsy.¹⁴⁻¹⁶ The results of Calis and Kulak's research indicate that there is a correlation between the severity of swallowing disorder and the severity of cerebral palsy, and in children with the most severe type of cerebral palsy (involvement of all four organs), swallowing disorder is more common.¹⁷⁻¹⁸

The purpose of this study was to determine the prevalence of swallowing disorders in children with cerebral palsy and to determine the relationship between type of cerebral palsy and severity of swallowing disorder.

Materials and methods

This study was descriptive-analytic and conducted in a cross-sectional manner. The target population in this study was children who were diagnosed with cerebral palsy by a neurologist. In this study, 60 children referred to Speech Therapy Clinics of Hamedan University of Medical Sciences participated in this study under the control of Speech and Language pathologists by simple random sampling method. Children who suffered from seizures during the past year or oral-facial impairment such as cleft palate and lip and dental defects were excluded from the study. Data were collected by a questionnaire

of demographic variables and a pediatric evaluation scale for severe feeding problems. The demographic variables questionnaire included sex, age and type of palsy. The child's assessment scale for severe swallowing disorders was also used to diagnose swallowing problems. This test consists of 15 items in 2 parts, where information from items is obtained based on severity and each item is calculated based on a 4-point Likert scale. The overall scores range from 0 to 100, which 0 to 25 was severe, 25 to 50 were moderate, 50 to 70 were mild, and 70 to 100 were without impairment. Crist et al.¹⁹ Reported a appropriate validity of this test and its reliability was calculated using $\alpha = 0.89$ using Cronbach's alpha coefficient.¹⁹ In this study, the reliability of the child's assessment scale for severe nutritional disorders was obtained by using Cronbach's alpha coefficient and $\alpha = 0.81$. Content validity of this scale was also evaluated using Lawshe's technique and content validity index was 0.73. The parents of the children studied were taken informed consent to participate in the study, and they were assured that their information would be kept confidential. The data were analyzed by SPSS 16 software and one-way ANOVA.

Results

Of the 60 children studied, 33 (55%) were male. Their minimum age was 17 months and a maximum of 7 years with a standard deviation of 1.78 years. 30 (50%) of the children were spastic cerebral palsy, 20 (33.34%) were flacid cerebral palsy and 10 (16.66%) had athetoid cerebral palsy. Table 1 shows the prevalence of swallowing disorders in children with cerebral palsy, depending on their type of paralysis.

Based on the results of one-way ANOVA test as shown in Table 2 and Table 3, there is a significant relationship between the mean score of swallowing disorder and type of cerebral palsy, which was determined by post-test by LSD method, Mean scores of severity of swallowing disorder in children with paralysis Spastic and Flacid have no significant difference ($P_v = 0.95$); However, the difference in mean scores of children with atheoid cerebral palsy with spastic and flacid cerebral palsy was significant ($P_v = 0.005$ and $P = 0.009$, respectively). Also, the lowest severity of swallowing disorder in children with atheoid cerebral palsy was observed ($M = 80.26$).

Table 1 Prevalence of swallowing disorder in children with cerebral palsy

Swallowing disorder(percent)			Paralysis
Mild	Moderate	Severe	
16.66	60	23.34	Spastic
15	70	15	Flacid
40	60	0	Athetoid

Table 2 score comparison of swallowing disorder in children with cerebral palsy

	N=60				P Value
	SS	df	MS	F	
Between	1528.4	2	764.2	4.63	0.014
Within	9400.1	57	164.9		
Sum	10928.5	59			

Table 3 Mean of swallowing disorder severity in cerebral palsy group

Variable	N=60					
	Spastic		Flacid		Athetoid	
	M	SD	M	SD	M	SD
Swallowing disorder	40.4	13.9	40.2	12.4	26.8	9.5

Discussion

Swallowing disorders can occur in any of the oral, pharyngeal and esophageal stages. The results of this study showed that overall swallowing problems in children with cerebral palsy are prevalent. The study of Calis et al. Reported the prevalence of nutritional problems in these children by 99%.¹⁷ In this study, all children with cerebral palsy had at least one type of swallowing problem based on the assessment of the child for severe swallowing disorders. The Helfrich-Miller study reported that there are the oral-movement abnormalities in children with cerebral palsy, such as abnormal tounge protrusion, hyper and hypo gag reflex, oral hypersensitivity, biting reflux, and inappropriate lip and tongue function.²⁰ In this study, most children with cerebral palsy had some degree of oral-facial problems and abnormalities in the swallow oral and pharyngeal stages. The problem with these stages, especially if accompanied with symptoms such as poor control of the tounge, the presence of biting reflexes and malfunctioning of the velo-pharyngeal reflux, will lead to a slow passage of food from the throat and as a result of aspiration.

In this study, the type of cerebral palsy was determined based on the classical classification (neuroanatomical location of the lesion). It was found that the severity of swallowing disorder varies in types of cerebral palsy, so that children with athetoid cerebral palsy had the lowest severity of problems. This difference in the severity of swallowing disorder may be related to the extent and location of the neurological disorder. spastic palsy is due to the two-sided injury of the upper motor neuron (the pyramidal and extra-pyramidal pathways), and children with more damage to the cortico-spinal and cortico-medullary pathways have more malfunction in voluntary stages, and then the athetoid paralysis that due to lesions of the basal ganglia, This will cause more oral -motor impairments and, consequently, a more severe swallowing disorder.^{21,22} Voluntary control plays an important role in the oral and pre-oral stages of swallowing. In these stages, inappropriate functioning in the voluntary movements of the tongue, lips, tongues and cheek leads to malfunctioning of the mouthpiece formation and then problems with swallowing it and even aspiration. Other factors that aggravate swallowing problems in children with spastic and flacid paralysis is the inapparopriate status of the body while eating. In order to have proper nutrition, it is necessary for the person to sit in a position where the knees are bent and on the ground and head and trunk in one direction and the neck is slightly forward to allow the oral and respiratory movements to take place easily. In children with cerebral palsy, and especially spastic and flacid children, this ideal condition is not possible, and this may cause respiratory problems and aspiration. Also, hand movement impairment and inappropriate body status in these children will also prevent independent nutrition in these children and often require parental support for nutrition, which causes resentment of parent.²² So, depending on the severity of the nerve injury and the resulting amount of motor problems, the severity of the problems of swallowing will also change. This finding is consistent with the findings of Reilly.⁴

Conclusion

The present study showed that swallowing problems in children with cerebral palsy are high and related to the type of cerebral palsy (severity of lesion) in these children. Because nutritional and swallowing problems prevent children from developing their physical and cognitive development, making them difficult to treatment plan and rehabilitation in children, accurate evaluation of these problems is essential.

Also, providing appropriate therapeutic interventions not only affects the quality of life of these children, but also prevents future problems and has a direct impact on the emotional and physical health of these children. The lack of similar Farsi studies and the lack of cooperation of some children, which resulted in exclusion them, were the most important limitations of this study. Given the importance of the subject and the available results, it is suggested that designing clinical interventions should be considered in future studies.

Acknowledgment

This article is the result of a research project that has been registered at Tehran University of Medical Sciences. Thanks, therefore, for all the children participating in this research, as well as for the cooperation of their families, which helped us to foster this in-depth study.

Conflicts of interest

The author declares there is no conflict of interest.

References

- Vik T, Skrove M, Dollner H, et al. Feeding problems and growth disorders among children with cerebral palsy in south and north Trondelag. *Tidsskr Nor Laegeforen*. 2001;121(13):1570–1574.
- Kulak W, Sobaniec W. Magnetic resonance imaging of the cerebellum and brain stem in children with cerebral palsy. *Advances in Medical Sciences*. 2007;52(Suppl 1):180–182.
- Kulak W, Sobaniec W, Bockowski L, et al. Neurophysiologic studies of brain plasticity in children with cerebral palsy. *Rocz Akad Med Bialymst*. 2005;50(Suppl 1):74–77.
- Reilly S, Skuse D, Poblete X. Prevalence of feeding problems and oral motor dysfunction in children with cerebral palsy: a community survey. *The Journal of Pediatrics*. 1996;129(6):877–882.
- Lefton-Greif MA. Pediatric dysphagia. *Phys Med Rehabil Clin N Am*. 2008;19(4):837–851.
- Serlin M. *Language and Swallowing Intervention in Children with Cerebral Palsy*. USA: Southern Illinois University Carbondale; 2012.
- Croghan J, Burke E, Caplan S, et al. Pilot study of 12-month outcomes of nursing home patients with aspiration on videofluoroscopy. *Dysphagia*. 1994;9(3):141–146.
- Del Giudice E, Staiano A, Capano G, et al. Gastrointestinal manifestations in children with cerebral palsy. *Brain Dev*. 1999;21(5):307–311.
- Gisel EG. Oral-motor skills following sensorimotor intervention in the moderately eating-impaired child with cerebral palsy. *Dysphagia*. 1994;9(3):180–192.
- Wasko-Czopnik D, Paradowski L. Swallowing disorders in clinical practice. *Dysphagia in clinical practice*. 1999;10(1):5–17.
- Humbert IA, Robbins J. Normal swallowing and functional magnetic resonance imaging: a systematic review. *Dysphagia*. 2007;22(3):266–275.
- Saarienen T, Laaksonen H, Parviainen T, et al. Motor cortex dynamics in visuomotor production of speech and non-speech mouth movements. *Cerebral Cortex*. 2006;16(2):212–222.
- Benfer KA, Weir KA, Bell KL, et al. Oropharyngeal Dysphagia and Gross Motor Skills in Children with Cerebral Palsy. *Pediatrics*. 2013;131(5):1553–1562.
- Rezaei M, Mohammadi H, Rashedi V. The relationship between feeding problems and mental retardation. *Journal of Research in Rehabilitation Sciences*. 2012;8(3):419–425.
- Rezaei M, Rashedi V, Gharib M, et al. Prevalence of feeding problems in children with intellectual disability. *Iranian Rehabilitation Journal*. 2011;9:56–59.
- Rezaei M, Rashedi V, Heidari A. Eating problems among children with Down syndrome. *Journal of Kermanshah University of Medical Sciences*. 2013;16(8):682–684.
- Calis EA, Veugelers R, Sheppard JJ, et al. Dysphagia in children with severe generalized cerebral palsy and intellectual disability. *Developmental Medicine & Child Neurology*. 2008;50(8):625–630.
- Kulak W, Sobaniec W, Goscik M, et al. Clinical and neuroimaging profile of congenital brain malformations in children with spastic cerebral palsy. *Adv Med Sci*. 2008;53(1):42–48.
- Crist W, Dobbelsteyn C, Brousseau AM, et al. Pediatric assessment scale for severe feeding problems: validity and reliability of a new scale for tube-fed children. *Nutr Clin Pract*. 2004;19(4):403–408.
- Helfrich-Miller K, Rector K, Straka J. Dysphagia: Its treatment in the profoundly retarded patient with cerebral palsy. *Arch Phys Med Rehabil*. 1986;67(8):520–525.
- Webb W, Adler RK. *Neurology for the speech-language pathologist*. Mosby; 2008.
- Salghetti A, Martinuzzi A. Dysphagia in cerebral palsy. *Eastern Journal of Medicine*. 2012;17:188–193.