

Short Communication

Factors associated with feeding problems in children with cerebral palsy: A cross-sectional study from Indonesia

Dwi S. Maulidia^{1,2}, Tiangsa Sembiring^{1,2}, Yazid Dimiyati^{1,2}, Ika CD. Tanjung^{1,2}, Arlinda S. Wahyuni^{1,2}, Winra Pratita^{1,2}, Halida R. Nasution^{1,2}, Olayan Alharbi³ and Ayodhia P. Pasaribu^{1,2*}

¹Department of Pediatrics, Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia; ²Department of Pediatrics, H. Adam Malik Hospital, Medan, Indonesia; ³Department of Neurology, Faculty of Health, Université Paris Cité, France

*Corresponding author: ayodhia@usu.ac.id

Abstract

Children with cerebral palsy are at high risk for feeding difficulties and malnutrition due to motor impairments and associated conditions. The aim of this study was to evaluate the prevalence and types of feeding problems and their association with malnutrition in children with cerebral palsy. A cross-sectional study was conducted involving children under five years old with cerebral palsy of which were classified into spastic cerebral palsy subtype quadriplegic, hemiplegic, diplegic, and triplegic. Feeding problems were categorized as inappropriate feeding practices, reduced food intake, parental misperception, and food preferences using the Pediatric Symptom Checklist-17. Nutritional status was assessed using weight-for-age percentiles based on WHO growth chart. History of constipation and dysphagia were also recorded. Chi-squared test and Mann-Whitney U test were used to assess the factors associated with feeding problems and factors associated with nutritional status, as appropriate. A total of 54 children with cerebral palsy were included of which 38.9%, 33.3% and 25.9% had hemiplegia, diplegia and quadriplegia, respectively. Feeding problems were prevalent, with inappropriate feeding practices was the most common (70.4%) and malnutrition was identified in 59.3% of the children. No significant associations were observed between cerebral palsy subtypes and the types of feeding problems. Similarly, the type of feeding problem was not significantly associated with malnutrition. Constipation and dysphagia were reported in 31.5% and 37.0% of participants, respectively, and were significantly associated with nutritional status (both had $p < 0.001$). This study highlights that feeding problems and malnutrition are common in children with cerebral palsy, with inappropriate feeding practices being the most prevalent issue. Although no significant associations were found between cerebral palsy subtypes or the types of feeding problems and malnutrition, the findings emphasize the multifactorial nature of feeding challenges.

Keywords: Cerebral palsy, feeding problem, feeding difficulties, malnutrition, oral motor dysfunction

Introduction

Children's health is significantly affected by feeding problems, which can result in growth disorders, increased susceptibility to diseases, and even mortality [1]. These issues can also lead to cognitive and behavioral disorders and are associated with anxiety and eating disorders across



various age groups [2]. The etiology of feeding problems is multifactorial, involving overlapping classifications influenced by cultural and socio-economic variations [3]. Feeding problems are commonly categorized into inappropriate feeding practices, reduced food intake, parental misperception, and food preferences [1,3]. Among these, inappropriate feeding practices often arise from poor feeding techniques or as a response to challenges in the other categories, further suggesting the crucial role of parental involvement in the eating process [4,5,6].

Cerebral palsy is a neurological disorder characterized by impaired motor function development, leading to issues with posture, movement control, muscle strength, and often neurological symptoms such as spasticity, paralysis, and cognitive abnormalities [7,8]. These motor disorders can significantly impact feeding abilities, including difficulties in chewing and swallowing and triggering exaggerated reflexes during eating [9,10]. Consequently, growth and nutritional challenges are frequently reported in children with cerebral palsy, with feeding difficulties occurring in up to 40% of cases, particularly among those with severe motor impairments [11,12,13]. Studies have shown that inappropriate feeding practices, prolonged meal durations, and underweight conditions are prevalent among children with cerebral palsy, emphasizing the critical need for adequate nutrition to support their growth and development [10]. Malnutrition, exacerbated by feeding difficulties, adversely impacts physical growth, cognitive development, and overall health, increasing vulnerability to infections and impairing growth trajectories [14].

Despite the recognition of these challenges, limited research has explored the specific factors contributing to eating problems in children with cerebral palsy and their implications for nutritional status. According to previous studies, potential contributors include oral-motor dysfunction, gross motor impairments, speech or communication disorders, postural abnormalities, and the severity of cerebral palsy [15,16]. The aim of this study was to evaluate the types of eating problems in children with cerebral palsy, identify associated factors, and examine their impact on nutritional status.

Methods

Study design

A cross-sectional study was conducted at Haji Adam Malik Hospital, Medan, North Sumatra, Indonesia, from September 2023 to January 2024. A total of 54 children with cerebral palsy were involved. The diagnosis of cerebral palsy is made based on anamnesis, physical examination and supporting examinations from the pediatric neurology department. Children diagnosed with cerebral palsy were assessed for feeding problems, and categorized into inappropriate feeding practices, small eaters, parental misperception and food preferences. The results of this assessment were used to classify patients into several subcategories of cerebral palsy e.g., quadriplegic (all limbs involved), hemiplegic (one side of limbs involved), diplegic (both lower limbs involved without any significant upper limbs involvements), and triplegic (only one limb clinically functional).

Eligibility criteria

Total sampling was employed to recruit participants. The study included all children aged below five years old with cerebral palsy, did not use a feeding tube, and whose parents were willing to take part in this study who came to the pediatric outpatient clinic at Haji Adam Malik Hospital during the study period. Exclusion criteria included children with serious medical conditions such as central nervous system infection or malignancy.

Data collection and study variables

During the study, data on sociodemographic data were collected and cerebral palsy spastic type, feeding problems, history of constipation, history of dysphagia, and anthropometric-nutritional status were assessed. Types of spastic cerebral palsy were categorized as quadriplegic, hemiplegic, diplegic, and triplegic. The assessment of each patient was performed by the investigators with pediatrician supervision, and the diagnosis of cerebral palsy types was confirmed based on the motoric scale evaluation and limb involvement. A motoric scale of <4 suggested limb weakness or the respective limbs were clinically affected by cerebral palsy.

The feeding problem was categorized as inappropriate feeding practice, reduced food intake, parental misperception, and food preference according to Pediatric Symptom Checklist 17 (PSC-17). Inappropriate feeding practice corresponded to the intake of foods that were not age appropriate. This category also included insufficient parental knowledge regarding meal timing, food quality and quantity, and hygienic preparation and presentation. Reduced food intake was described as those who ate less than expected and exhibited poor nutritional status, despite caregivers adhering to proper feeding practices. Parental misperception referred to cases where parents believed their child has eating problems, but it was later confirmed that proper feeding practices were followed, and the child had good nutritional status. Selective eating referred to children who were picky eaters, displaying a preference for specific foods they considered acceptable to eat.

History of constipation and dysphagia was categorized as either present or absent. Feeding habit was defined as patterns or behaviors related to daily eating activities and could be extended to meal frequency or timing, food choices, dietary patterns, psychological or emotional factors, and even cultural plus environmental influences. Anthropometric nutritional status was assessed using the World Health Organization (WHO) child growth chart. The findings were interpreted based on weight-for-age, with values below the 3rd percentile classified as malnutrition.

Data analysis

The Kolmogorov-Smirnov normality test was performed to assess the data distribution. Continuous data were presented as mean and standard deviation (SD) in the case of normal distribution; otherwise, the data were presented as median (min-max). Categorical data were presented as percentages. Factors associated with feeding problems and factors associated with nutritional status in children with cerebral palsy were assessed using Chi-squared test or Mann-Whitney U test, as appropriate. Statistical significance was considered achieved when $p < 0.01$. SPSS version 20.0 (IBM, New York, USA) was employed for data analysis.

Results

Characteristics

A total of 54 children with cerebral palsy were included and their demographic characteristics are presented in **Table 1**. Out of the total, 51.9% were male with a median age of 2.96 years. All children had a primary course schedule on a daily basis ($n=54$, 100%), with over half also having supplementary or additional meal courses ($n=32$, 59.3%). Hemiplegic ($n=21$, 38.9%) and diplegic ($n=18$, 33.3%) spasticity were the most prevalent types. Feeding problems occurred in all children, with inappropriate feeding practices being the most common ($n=38$, 70.4%), followed by food preference ($n=16$, 29.6%). The majority of children were categorized as severely malnourished ($n=32$, 59.3%).

Table 1. Demographic characteristics of subjects in this study (n=54)

Demographic characteristics	Frequency (percentage)
Sex	
Male	28 (51.9)
Female	26 (48.1)
Age, years	
Median (min-max)	2.96 (2.00–5.00)
Spasticity type	
Diplegia	18 (33.3)
Hemiplegia	21 (38.9)
Quadriplegia	14 (25.9)
Triplegia	1 (1.9)
Feeding habits	
Main course	
Yes	54 (100.0)
None	0 (0.0)
Supplementary course	
Yes	32 (59.3)
None	22 (40.7)
Constipation	

Demographic characteristics	Frequency (percentage)
Yes	17 (31.5)
None	37 (68.5)
Dysphagia	
Yes	20 (37.0)
None	34 (63.0)
Type of feeding problem	
Inappropriate feeding practice	38 (70.4)
Food preference	16 (29.6)
Nutritional Status	
Malnutrition	22 (40.7)
Severe malnutrition	32 (59.3)

Factors associated with feeding problems

Factors associated with the type of feeding problems among children with cerebral palsy are presented in **Table 2**. Our data indicated that there were no association between sex, age, cerebral palsy spasticity type, having supplementary feeding, history of constipation, history of dysphagia with feeding problems among children with cerebral palsy (**Table 2**).

Table 2. Factors associated with feeding problems in children with cerebral palsy

Characteristics	Frequency (%)		p-value
	Inappropriate feeding practice (n=38)	Selective eating (n=16)	
Sex			0.439
Male	21 (75.0)	7 (25.0)	
Female	17 (65.4)	9 (34.6)	
Age (years), median (min-max)	3.13 (2.00–5.00)	2.67 (2.00–4.67)	0.448
Spasticity type			0.178
Diplegia	15 (83.3)	3 (16.7)	
Hemiplegia	15 (71.4)	6 (28.6)	
Quadriplegia	8 (57.1)	6 (42.9)	
Triplegia	0 (0)	1 (100)	
Supplementary feeding			0.753
Yes	16 (72.7)	6 (27.3)	
None	22 (68.8)	10 (31.2)	
Constipation			0.537
Present	11 (64.7)	6 (35.3)	
Absent	27 (73.0)	10 (27.0)	
Dysphagia			0.235
Present	16 (80.0)	4 (20.0)	
Absent	22 (64.7)	12 (35.3)	

Factors associated with nutritional status

There was no association observed among sex, age, cerebral palsy spasticity type and feeding habits with nutritional status among children with cerebral palsy (**Table 3**). However, our data indicated that both history constipation and history of dysphagia were associated with nutritional status in children with cerebral palsy, both had $p < 0.001$ (**Table 3**).

Table 3. Factors associated with nutritional status in children with cerebral palsy

Variable	Frequency (%)		p-value
	Severe malnutrition (n=22)	Malnutrition (n=32)	
Sex			
Male	10	18	0.435
Female	12	14	
Age (years), median (min-max)	2.71 (2–4.67)	3.04 (2–5)	0.660
Spasticity type			
Diplegia	6	12	0.490
Hemiplegia	8	13	
Quadriplegia	7	7	
Triplegia	1	0	
Feeding problems			
Inappropriate feeding practice	17	22	0.492
Selective eating	5	10	
Constipation			
Present	14	3	<0.001*

Variable	Frequency (%)		p-value
	Severe malnutrition (n=22)	Malnutrition (n=32)	
Absent	8	29	
Dysphagia Present	15	5	<0.001*
Absent	7	27	

* Statistically significant at $p < 0.05$

Discussion

This study included 54 children with cerebral palsy, with a median age of 2.96 years. Hemiplegia was the most common type (38.9%), followed by diplegia (33.3%) and quadriplegia (25.9%). Most children had a regular daily eating routine, but supplementary courses were less common. Constipation and dysphagia affected 31.5% and 37.0% of the children, respectively. Although all children had a main course in their daily meals, nearly half were diagnosed with malnutrition. Unfortunately, this study primarily evaluated the types of feeding problems, which were not significantly associated with malnutrition. Limited sample sizes may have contributed to the lack of significant findings. Both inappropriate feeding practices and food preference disorders appear influenced by a combination of parental and child-related factors. Diplegia showed the highest proportion of inappropriate feeding practices, followed by hemiplegia and quadriplegia. However, no significant association was found between spasticity type and feeding disorders. Comparatively, a previous study reported that spastic quadriplegic was the most common finding in their study with 41.2% of its population, closely followed by spastic diplegic (40.0%) [11]. Findings from other published reports also witnessed similar distribution of feeding problems across different cerebral palsy types [15,16,17].

This study primarily examined the types of feeding problems in children with cerebral palsy, noting a high prevalence of feeding difficulties and malnutrition. Furthermore, malnutrition was documented in 59.3% of the children, consistent with meta-analysis findings reporting a global prevalence of 40% using weight-to-age indices. This highlights the significant impact of feeding challenges on nutritional status in cerebral palsy. Our data suggested a significant association between both constipation and dysphagia with nutritional status. This is consistent with findings in the previously published literature that link gastrointestinal and swallowing difficulties with malnutrition in this population [18,19]. The existence of oral-motor dysfunction may deteriorate the condition of feeding disorders through swallowing difficulties, inadequate lip closure, perioral hypersensitivity (or perhaps hypersensitivity based on individualized findings), poor gag reflex, or even primitive reflex in chewing [20,21]. These factors likely contributed to severe feeding disorders due to increased difficulty in feeding practices observed by caregivers [18,22,23]. Other studies reported that children with spastic quadriplegic possess the highest risk for developing more severe feeding problems [24,25].

The findings did not reveal significant associations between spasticity type or age and the type of feeding problems. These are in line with previous meta-analyses that emphasize the multifactorial nature of malnutrition in children with cerebral palsy [26]. Instead, caregiver practices and motor impairment severity may play key roles in shaping feeding challenges [21]. There is a need for multifactorial approaches and individualized interventions in addressing feeding challenges in children with cerebral palsy. Nutritional support and targeted feeding strategies should integrate caregiver practices and clinical rehabilitation [20]. Clinically, the association between malnutrition and gastrointestinal factors corresponds to the necessity of integrated care teams, including dietitians and gastroenterologists. Early identification and intervention for constipation and dysphagia could mitigate their adverse effects on nutrition and overall health.

Several limitations should be acknowledged, including the limited sample size that affects the generalizability of the findings. Moreover, the cross-sectional design precludes causal inferences about relationships between types of feeding problems, nutritional status, and associated factors. Future research should integrate standardized nutritional assessment methods, including daily intake of nutrients and fluids, and the role of socioeconomic and parental education to enhance the precision of findings and reduce bias.

Conclusion

Our data indicated that that feeding problems and malnutrition were common among children with cerebral palsy. The high prevalence of feeding difficulties highlighted their significant impact on nutritional status. The findings showed that types of feeding problems, such as inappropriate feeding practices and food preference disorders were not significantly associated with malnutrition. Additionally, factors like spasticity type and age were not found to influence the type of feeding problems. These observations suggested the multifactorial nature of feeding challenges in this population and the need for continued research to elucidate these complexities and inform effective interventions.

Ethics approval

This study was approved by the Health Research Ethics Committee of the Universitas Sumatera Utara, Medan, Indonesia (No.1067/KEPK/USU/2023).

Acknowledgments

The authors wish to thank the parties that have supported the investigation in this study, particularly the students and their parents.

Competing interests

The Authors have no known conflict of interest in relation to the publication of this work.

Funding

The study did not receive external funding.

Underlying data

Data underlying this study can be requested from the corresponding authors upon reasonable request.

Declaration of artificial intelligence use

We hereby confirm that no artificial intelligence (AI) tools or methodologies were utilized at any stage of this study, including during data collection, analysis, visualization, or manuscript preparation. All work presented in this study was conducted manually by the authors without the assistance of AI-based tools or systems.

How to cite

Maulidia DS, Sembiring T, Dimiyati Y, *et al.* Factors associated with feeding problems in children with cerebral palsy: A cross-sectional study from Indonesia. *Narra X* 2024; 2 (3): e163 - <https://doi.org/10.52225/narrax.v2i3.163>.

References

1. Goday PS, Huh SY, Silverman A, *et al.* Pediatric feeding disorder: Consensus definition and conceptual framework. *J Pediatr Gastroenterol Nutr* 2019;68(1):124-129.
2. Manikam R, Perman JA. Pediatric feeding disorders. *J Clin Gastroenterol* 2000;30(1):34-46.
3. Riaz Y, Sergi C. Feeding disability in children. Treasure Island: StatPearls; 2023.
4. Bąbik KM, Horvath A, Dziechciarz P, *et al.* Feeding difficulties: Etiology and growth parameters. *Arch Med Sci* 2020:1-5.
5. Sjarif D, Yulianti K, Lubis G, *et al.* Pendekatan diagnosis dan tata laksana masalah makan pada batita di Indonesia. Jakarta: IDAI; 2014.
6. Bernard-Bonnin AC. Feeding problems of infants and toddlers. *Can Fam Physician* 2006;52(10):1247-1251.
7. Liptak GS, Murphy NA. Providing a primary care medical home for children and youth with cerebral palsy. *Pediatrics* 2011;128(5):e1321- e1329.
8. Fidan F, Baysal O. Epidemiologic characteristics of patients with cerebral palsy. *Open J Ther Rehabil* 2014;2(3):126-132.

9. Speyer R, Cordier R, Kim JH, *et al.* Prevalence of drooling, swallowing, and feeding problems in cerebral palsy across the lifespan: A systematic review and meta-analyses. *Dev Med Child Neurol* 2019;61(11):1249-1258.
10. Reilly SM, Skuse DH, Wolke D, *et al.* Oral-motor dysfunction in children who fail to thrive: Organic or non-organic? *Dev Med Child Neurol* 1999;41(2):115-122.
11. Nur FT, Handryastuti S, Poesponegoro HD. Feeding difficulties in children with cerebral palsy: Prevalence and risk factor. *KnE Life Sci* 2019;4(12):206.
12. Jahan I, Sultana R, Afroz M, *et al.* Dietary intake, feeding pattern, and nutritional status of children with cerebral palsy in rural Bangladesh. *Nutrients* 2023;15(19).
13. Rebelo F, Mansur IR, Miglioli TC, *et al.* Dietary and nutritional interventions in children with cerebral palsy: A systematic literature review. *PLoS One* 2022;17(7):1-15.
14. Dwipoerwantoro P. Masalah saluran cerna pada anak dengan palsy serebral. In: Soebadi A, editor. *Proceedings of update in child neurology: Everything you should know about motor and movement problems in children*. Jakarta: IDAI; 2017.
15. Cieri ME, Ruiz Brunner MM, Condinanzi AL, *et al.* Nutritional status and dietary intake of children and adolescents with cerebral palsy. *Clin Nutr ESPEN* 2023;57:391-398.
16. Lopes PAC, Amancio OMS, Araújo RFC, *et al.* Food pattern and nutritional status of children with cerebral palsy. *Rev Paul Pediatr* 2013;31(3):344-349.
17. Sleigh G, Brocklehurst P. Gastrostomy feeding in cerebral palsy: A systematic review. *Arch Dis Child* 2004;89(6):534-539.
18. Aggarwal S, Chadha R, Pathak R. Feeding difficulties among children with cerebral palsy: A review. *Int J Health Sci Res* 2015;5(3):297.
19. Steinberg C, Menezes L, Nóbrega AC. Oral motor disorder and feeding difficulty during the introduction of complementary feeding in preterm infants. *Codas* 2021;33(1):1-6.
20. Ahmad S, Sharif F, Karamat I. Feeding problems at different level of gross motor function in children with cerebral palsy. *J Riphah Coll Rehabil Sci* 2020;8(2):64.
21. Chidomere RI, Ukpabi IK, Chukwudi NK, *et al.* Prevalence and pattern of feeding problems and relationship to motor function severity in children with cerebral palsy in Umuahia. *West Afr J Med* 2023;40(1):245-249.
22. Mei C, Hodgson M, Reilly S, *et al.* Oromotor dysfunction in minimally verbal children with cerebral palsy: Characteristics and associated factors. *Disabil Rehabil* 2022;44(6):974-982.
23. Roig-Quilis M. *Oromotor dysfunction in neuromuscular disorders: Evaluation and treatment*. Second Edition. Amsterdam: Elsevier Inc; 2015.
24. Raj NM, Veena KD, Rajashekhar B, *et al.* Oral sensory issues with feeding and communication skills in autistic children. *Adv Neurodev Disord* 2024;8(2):271-280.
25. Baraskewich J, von Ranson KM, McCrimmon A, *et al.* Feeding and eating problems in children and adolescents with autism: A scoping review. *Autism* 2021;25(6):1505-1519.
26. Da Silva DCG, De Sá Barreto Da Cunha M, De Oliveira Santana A, *et al.* Malnutrition and nutritional deficiencies in children with cerebral palsy: A systematic review and meta-analysis. *Public Health* 2022;205:192-201.