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ORIGINAL ARTICLE

Prevalence and Pattern of Feeding Problems and Relationship to Motor Function Severity in Children with Cerebral Palsy in Umuahia

Prévalence et Structure des Problèmes d'Alimentation et Relation avec la Sévérité de la Fonction Motrice chez les Enfants Atteints de Paralysie Cérébrale à Umuahia

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ABSTRACT

BACKGROUND: Reports show that feeding problems in children with cerebral palsy (CP) significantly reduce nutritional intake and affect their nutritional status.

OBJECTIVE: To determine the prevalence and types of feeding problems and its association with functional severity and nutritional status in children with cerebral palsy.

METHODS: This cross-sectional study involved 169 children with CP aged 1 – 17 years seen at the Neurology clinic of Federal Medical Centre, Umuahia. Gross motor skills were described using Gross Motor Function Classification System (GMFCS).Nutritional status was determined and classified based on WHO Child Growth Standards. Data was analyzed using SPSS version 20.0

RESULTS: Feeding problem was seen in 39.1% of the subjects, with spitting out food (57.6%), prolonged feeding time (45.5%) and choking (16.7%) being the most common types. Malnutrition occurred in 37.3% of patients. Feeding problems were significantly associated with functional severity ($\chi^2 = 52.06$ and $p < 0.001$) and proportion of feeding problems increased with increasing functional severity. All the subjects with functional severity level V (100%) had feeding problems. There was no statistically significant association between nutritional status and feeding problems ($\chi^2 = 0.77$ and $p = 0.38$), although the proportion of feeding problems was highest (44.3%) in the underweight subjects.

CONCLUSION: The prevalence of feeding problem in children with CP is 39.1%. There was no association between feeding problems and nutritional status. Feeding problem was however significantly associated with functional severity. Therefore there is need for routine evaluation for feeding problems in children with CP to prevent complications. **WAJM 2023; 40(1): 55–59.**

Keywords: Cerebral Palsy, Functional severity, Feeding problems, Nutrition, Umuahia.

RÉSUMÉ

CONTEXTE: Les rapports montrent que les problèmes d'alimentation chez les enfants atteints de paralysie cérébrale (PC) réduisent de manière significative l'apport nutritionnel et affectent leur statut nutritionnel.

OBJECTIF: Déterminer la prévalence et les types de problèmes d'alimentation et leur association avec la sévérité fonctionnelle et le statut nutritionnel des enfants atteints de paralysie cérébrale.

MÉTHODES: Cette étude transversale a porté sur 169 enfants atteints de paralysie cérébrale âgés de 1 à 17 ans et vus à la clinique de neurologie du Centre médical fédéral, Umuahia. Les capacités motrices brutes ont été décrites à l'aide du système de classification de la fonction motrice brute (GMFCS), l'état nutritionnel a été déterminé et classé selon les normes de croissance de l'enfant de l'OMS. Les données ont été analysées à l'aide de SPSS version 20.0.

RÉSULTATS: Des problèmes d'alimentation ont été observés chez 39,1 % des sujets, les plus fréquents étant les régurgitations (57,6 %), le temps d'alimentation prolongé (45,5 %) et l'étouffement (16,7 %). La malnutrition est apparue chez 37,3 % des patients. Les problèmes d'alimentation étaient significativement associés à la sévérité fonctionnelle (÷2 = 52,06 et $p < 0,001$) et la proportion de problèmes d'alimentation augmentait avec la sévérité fonctionnelle. Tous les sujets présentant un niveau de sévérité fonctionnelle V (100%) avaient des problèmes d'alimentation. Il n'y avait pas d'association statistiquement significative entre l'état nutritionnel et les problèmes d'alimentation (÷2 = 0,77 et $p = 0,38$), bien que la proportion de problèmes d'alimentation était la plus élevée (44,3 %) chez les sujets présentant une insuffisance pondérale.

CONCLUSION: La prévalence des problèmes d'alimentation chez les enfants atteints de PC est de 39,1%. Il n'y avait pas d'association entre les problèmes d'alimentation et l'état nutritionnel. Les problèmes d'alimentation étaient cependant significativement associés à la sévérité fonctionnelle. Il est donc nécessaire de procéder à une évaluation systématique des problèmes d'alimentation chez les enfants atteints de PC afin de prévenir les complications. **WAJM 2023; 40(1): 55–59.**

Mots clés: Infirmité motrice cérébrale, Sévérité fonctionnelle, Problèmes d'Alimentation, Nutrition, Umuahia.

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Abbreviations: BMI, Body Mass Index; **CP,** Cerebral Palsy; **FMC,** Federal Medical Centre; **GMFCS,** Gross Motor Function Classification System; **SSPS,** Statistical Package for the Social Sciences; **WHO,** World Health Organization.

INTRODUCTION

Cerebral palsy refers to motor impairments that result from an insult to the immature motor cortex and/or its motor pathways.[1]Children with CP often have severe postural, tone and movement disorders that can result in oral motor dysfunction, gastrointestinal problems and impaired hand to mouth coordination, which can affect the feeding process.[2,3]Although the defined problem of children with CP is impaired motor function, 25–80% have additional non-motor impairments which include disturbances of perception, cognition and communication, seizure disorders and feeding problems.[4]

It has been reported that majority of the children with CP have feeding problems which are present even in the early age.[5,6]The prevalence of feeding problems in children with CP have been docu mented in the range of 30 to 90%.[2,7] Those with moderate to severe CP often have pseudobulbar palsy resulting in difficulty in swallowing and severe motor dysfunction with abnormal posture that lead to poor mouth closure or lip seal, tongue thrusting, incoordinate mouthing movements.[8] Also cognition impairment and communication may contribute to inability to request for food and drink.[7] Mechanism that contributes to feeding difficulty and excessive drooling in some of them, predisposing them to poor health and affects the nutritional status. Poor positioning while feeding by caregivers and gastro-oesophageal reflux may cause aspiration leading to chronic aspiration.[8] Children with only mild feeding dysfunction, requiring chopped or mashed foods, may also be at risk of poor nutritional status.[9] Studies[2,9,11,12] have indicated numerous types of feeding problems in children with CP. Some common problems includes requirement of help during feeding, swallowing dysfunction, choking during feeding, prolonged feeding time (>3 hour per day), constipation, frequent vomiting, drooling, rejection of solid foods. Coughing and spillage during feeding have also been reported.[8,11,12] Presence of feeding problems may make it difficult for children with CP to achieve a satisfactory nutritional intake and this may result in chronic malnutrition affecting their physical growth.[11] Polack *et al*[12] in Ghana demonstrated in their study that difficulties with feeding are a key mechanism linking CP and malnutrition. Dahl *et al*[13] in USA found that severely disabled children with CP in the youngest age group who have feeding problems are most at risk for poor nutritional status. Being nutritionally deficient may exacerbate the effects of primary brain injury in them.[8] Feeding difficulties can result in stressful mealtimes and can have a psychosocial impact for the child.[14] Feeding dependence may also, have an impact on parents/caregivers and other family members in other ways.[8,15] This can reduce quality of life for caregiver and child which may lead to early death. There is paucity of data regarding prevalence and pattern of feeding problems in children with CP in our sub-region. More so, these children are not routinely evaluated for feeding problems except those that have severe difficulties which impose serious burden to the caregivers. Most often caregivers are ignorant of the presence and or the manifestation of these feeding difficulties. Hence, these children present with complications such as under-nutrition and aspiration. Mei Hou *et al*[5] demonstrated in their study the need to routinely evaluate every child with CP for feeding problems and nutritional status irrespective of the functional severity. The aim was to institute early rehabilitation and nutritional interventions which can significantly improve their quality of life. This study was therefore carried out to determine the prevalence and pattern of feeding problems and the relationship with functional severity in children with cerebral palsy attending Child Neurology Clinic of Federal Medical Centre, Umuahia, Abia State.

SUBJECTS, MATERIALS AND METHODS

Study Design

This was a descriptive, hospital-based, cross-sectional study carried out between 3rd July and 1st December 2017 that focused on the prevalence and pattern of feeding problems and relationship to motor function severity in children with cerebral palsy in Umuahia, Abia State, Nigeria.

Study Area

The study was conducted in the paediatric neurology outpatient-clinic of the Federal Medical Centre Umuahia, Abia State, South-Eastern Nigeria. The hospital serves as a referral centre for all the primary and secondary health institutions in the state. It caters for people of Abia State as well as surrounding community from neighbouring states.

Ethical Clearance

Approval for the study was obtained from the Health Research Ethics Committee (HREC) of the FMC, Umuahia (Number: FMC/QEH/G.596/vol.10/209). An explanation of the aim and objectives of the study was given to the parents or caregivers in their language. A written informed consent was obtained from the parents / guardians and assent where obtainable. Participation in the study was voluntary and at no cost to patients.

Sample Size Determination

The minimum sample size for this study was calculated using the standard statistical formula for finite populations (numbering less than 10,000) as shown below.[16]

$NF = n_0/(1 + n_0/N)$

With degree of accuracy (d) at 95% confidence limit (0.05), Z a constant usually set at 1.96 and prevalence of feeding problems in children with CP of 50%[17] giving the attrition rate of 10%, the sample size of 169 was estimated.

Inclusion and Exclusion Criteria

Patients who had no other neurologic disorder such as neuromuscular or neurodegenerative disorders that could cause feeding problems or any non-neurological disorder that could cause significant respiratory distress which can affect feeding were included in the study. Also patients whose caregivers gave their consent were enrolled consecutively for the study. Excluded were those with associated cardiac anomaly or respiratory problem resulting in respiratory distress which could affect feeding time and swallowing or congenital malformations that could independently affect food intake e.g. cleft lip and/or palate. Children whose parents/guardians refused to give

their consent for the study were also excluded.

Patient Recruitment

A total of 169 children with cerebral palsy, aged 1–17years were recruited within the period of study. An average of five new patients with CP and seven registered CP patients on follow up are seen on each clinic day. Due to high default rate an average of eight patients were recruited on each clinic day for the period of study. Folders of recruited patients were colour-coded to avoid re-recruitment. Each subject was assessed to determine the type of CP, nutritional statue and feeding difficulty. Classification of CP was based on abnormalities of muscle tone and anatomical distribution of the motor impairment,[18] while the severity was assessed using Gross Motor Function Classification System (GMFCS).[19] Subjects' weights were measured using Seca 360 or Seca 374 (for ages <2years) while height and length with stadiometre and measuring mat seca 210. Nutritional status was determined and classified based on WHO Child Growth Standards[20] (weight-for-age and BMI-for-age). Feeding problems such as sucking, chewing and swallowing difficulties; spitting out of feeds, choking, prolonged feeding time (>3 hour per day), requirement of help during feeding, constipation, frequent vomiting and drooling were obtained from the parents or guardians using an interviewer administered questionnaire. A data proforma was used to obtain all the information from the parents / guardians. The socioeconomic class of each child was obtained using the social classification described by Oyedeji *et al.*[21]

Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 20.0. All qualitative variables were expressed in form of frequencies and percentages, while mean and standard deviation were calculated for age. The association between feeding problem and severity of CP and nutritional status was determined using chi-squared test and p value of <0.05 was considered statistically significant.

RESULTS

Table 1 shows the socio-demographic characteristics of children with CP. The ages of the subjects ranged from one year to 17years with a mean (SD) age of 3.53 (±3.74). Of a total of 169 patients, 90 (53.3%) were males with a male: female ratio of 1.1:1. Also 136 subjects (80.5%) belonged to the age group of 1–5 years. The highest proportion of them (56.2%) belonged to middle socioeconomic class while 17.2% belonged to the lower class.

Delivery was at term for 149 (88.2%) subjects and spontaneous vertex delivery was the most commont mode of delivery for 142 (84.0%) subjects.

Majority of the subjects had spastic CP (82.8%), with spastic diplegia (43.8%) as the most common followed by spastic quadriplegia (27.2%). The severity of motor disability was GMFCS level III in 46.7% of the subjects while the less frequent levels were the level I (3.0%) and level V (7.7%) as shown in Table 2.

Nutritional status is shown in Table 3. Majority (62.7%) had normal weight, 36.1% had underweight malnutrition and overweight was seen in 1.2% of them.

Out of 169 subjects, 66 (39.11%) had feeding problems as shown in Table 4. The most common types were spitting out food (57.6%), prolonged feeding time (45.5%) and choking (16.7%). Less frequent types were inability to chew (3.0%), swallowing difficulties (6.1%) and inability to suck (4.5%).

Table 5 shows the association between functional severity and feeding problems in children with CP. Feeding problems were significantly associated with functional severity ($\chi^2 = 52.06$ and $p < 0.001$) as proportion of feeding problems increased with increasing functional severity. All the subjects with functional severity level V (100%) had feeding problems.

Table1: Sociodemographic Characteristics of Children with CP

Characteristic	Frequency N=169	Percentage (%)
Gender		
Male	90	53.3
Female	79	46.7
Age (in years)		
1–5	136	80.5
6–10	15	8.9
11–15	15	9.9
16–17	3	1.7
Mean+SD (median)	3.53+3.74 (2)	
Social Class		
High	45	26.6
Middle	95	56.2
Low	29	17.2
Total	**169**	**100.0**

Table 2: Type and Severity of CP among the Children

Variable	Frequency N=169	Percentage (%)
Type of CP		
Spastic diplegia	74	43.8
Spastic quadriplegia	46	27.2
Dyskinetic	23	13.6
Spastic hemiplegia	19	11.2
Mixed	5	3.0
Double hemiplegia	1	0.6
Flaccid	1	0.6
Functional Severity of CP		
I	5	3.0
II	33	19.5
III	79	46.7
IV	39	23.1
V	13	7.7

Table 3: Distribution of Children with CP by Nutritional Status

Nutritional Status	Frequency N=169	Percentage (%)
Normal	106	62.7
Underweight	61	36.1
Overweight	2	1.2

Table 4: Prevalence and Type of Feeding Problems/Difficulty among Children with CP

Prevalence and Type of Feeding Difficulty	Frequency N=169	Percentage (%)
Feeding Difficulty		
Yes	66	39.1
No	103	60.9
Type of Feeding Difficulty		
Spitting	38	57.6
Prolonged feeding	30	45.5
Chokes	11	16.7
Cannot chew	2	3.0
Cannot suck	3	4.5
Swallowing difficulty	4	6.1

Table 6 shows the association between nutritional status and feeding problems in children with CP. Although the proportion of feeding problems was highest (44.3%) in the underweight subjects, there was no statistically significant association between nutritional status and feeding problems ($\chi^2 = 0.77$ and $p = 0.38$).

Table 5: Association between Functional Severity and Feeding Problems in Children with CP

GMFCS	Feeding Problem		χ^2	P-value
	No N=103 (%)	Yes N=66(%)		
Level I	5 (100.0)	0 (0.0)		
Level II	31 (93.9)	2 (6.1)		
Level III	55 (69.6)	24 (30.4)	52.06	<0.001
Level IV	12 (30.8)	27 (69.2)		
Level V	0 (0.0)	13 (100.0)		

Table 6: Association between Nutritional Status and Feeding Problems in Children with CP

Nutritional Status	Feeding Problem		χ^2	P-value
	No N=103 (%)	Yes N=66(%)		
Underweight	34 (55.7)	27 (44.3)	0.77	0.38
Normal/Overweight	69 (65.1)	39 (34.9)		

DISCUSSION

Feeding problems may negatively impact the growth and overall health of any child with CP especially those with severe functional limitation and most times caregivers are not aware of the presence of feeding problems in these children. In the present study, we explored various feeding problems prevalent in children with CP.

The prevalence of feeding problems in the present study was 39.1%. This finding falls within the reported prevalence range of 30–90%.[2,7,8,13] The present study comprised more of children with moderate CP (GMFCS level III). Studies that reported higher prevalence had more subjects with severe CP (GMFCS level IV and V).[2,7,8,13] The most frequent feeding problems found in the present study were spitting out of food, prolonged feeding time and choking. Different studies have reported different feeding problems in patients with CP.[2,7,8,14] Gangil *et al*[7] in India reported constipation, vomiting, choking and prolonged feeding time as the most frequent pattern. Usman *et al*[8] in Pakistan objectively assessed patients and also interviewed caregivers reported drooling (66.7%), absent tongue lateralization, and hypertonic tongue as the most frequent feeding problems. Our report was solely from caregivers who might not have appreciated some of the feeding problems. Nur *et al*[2] reported swallowing difficulty, prolonged feeding time and choking as most common feeding problems. In their method, they included eating ability observation as they were set to determine the risk factors of feeding problems. Feeding problem was significantly associated with functional severity in the present study. All subjects (100%) with most severe functional limitation (GMFCS V) had feeding problems, while none (0%) of mild CP (level I) had feeding problems. Similar findings were reported by Nur *et al*[2] who found feeding problems more in subjects with severe CP although most of their subjects had severe functional limitation. Gangil *et al*[7] noted that the risk of feeding problems increased with severity of functional limitation as reported in the present study. Dahl *et al*[13] in USA reported that the risk for underweight malnutrition were severe functional limitation with feeding problems and younger age group.

The present study did not find any association between feeding problems and nutritional status in children with CP. Although the proportion of feeding problems was highest (44.3%) in the subjects with underweight malnutrition, there was no statistical significant association between them. This could be because most of the subjects had moderate CP (GMFCS III). Spasticity that can affect oromotor function and other feeding techniques are less severe in those with GMFCS III when compared to those with GMFCS IV and V. Moreover, most of the subjects (80.5%) belonged to the age group of 1–5 years, the age group totally dependent on the caregivers/guardians for care. Contrary to the finding of the present study, Polack *et al*[12] found significant malnutrition among CP with mild severity, which showed that severe functional limitation could not be the only determinant factor for malnutrition in children with CP. The risk factors for malnutrition in CP reported by them were functional severity, lower socioeconomic level, young age and caregiver burn out. Nur *et al*[2] reported a significant association between feeding problems and nutritional status. About 78% of the subjects had less calorie intake which they attributed to oromotor dysfunction, postural and tone abnormality. They noted that all subjects with malnutrition had severe functional limitation GMFCS level V and had poor calorie intake.

The limitations of this study include the fact that calorie intake and severity of feeding problems were not determined and that the study was conducted in an urban area and was also facility-based therefore findings cannot be generalised. In conclusion, the prevalence of feeding problems among children with CP in Umuahia was high (39.1%). There was no association between feeding problems and nutritional status. Feeding problem was however significantly associated with increase in functional severity. Therefore there is need for routine evaluation for feeding problems in children with CP to prevent complications.

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DECLARATIONS

Ethics Approval and Consent to Participate

Approval for the study was obtained from the Health Research Ethics Committee (HREC) of FMC, Umuahia. The study protocol was fully explained to the parents / guardians and written informed consent was obtained from them. Also assent was obtained as appropriate.

Conflict of Interest

None.

No financial assistance from any agency or financial body.

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