ORIGINAL ARTICLE

Feeding Disorders in Children Attending the Neurology Clinic in a Tertiary Hospital in Southern Nigeria.

Anthony O. Atimati, Olusola P. Okunola

ABSTRACT

Background: Feeding disorders are estimated to occur in up to 25 - 35% of healthy children and 80% of neurologically impaired children. Dysfunctional oral-motor control, abnormal neurologic maturation, poor seating posture during feeding among others result in feeding problems in children with neurologic disorders. Early detection and nutritional support are important in preventing poor growth and development which may result from feeding disorders.

Objective: To ascertain the presence of feeding disorders in children attending the neurology clinic of the University of Benin Teaching Hospital.

Materials and Methods: A descriptive cross-sectional study carried out in the University of Benin Teaching Hospital. A semi-structured interviewer-administered questionnaire was used in obtaining information from the parents/caregivers of the children who were recruited consecutively from the neurology clinic.

Results: Of the 154 subjects recruited for the study 63 (41%) and 59 (38%) had cerebral palsy and seizure disorder/epilepsy respectively. Fifty-six caregivers (36.4%) had unpleasant experience during mealtimes. Excessive salivation, choking and chewing difficulties ranked highest among the feeding problems in the children. Forty-four (28.6%) children had multiple feeding problems. Gender, age group, feeding experience and neurological diagnosis were significantly associated with multiple eating problems. Forty-one (26.6%) children were underweight while 7.1% were overweight.

Conclusion: Feeding problems, which are often accompanied by unpleasant mealtime experience for caregivers, are common in children with neurological impairments. Assessment of the feeding pattern and nutritional status of children should be undertaken in the outpatient neurology clinic.

Keywords: Feeding disorders, children, neurology clinic, neurological disorders

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Introduction

Feeding disorders are estimated to occur in up to 25 - 35% of healthy children and up to 80% of neurologically impaired children.[1] Feeding problems are heterogeneous and their magnitudes are often not recognized by parents and caregivers. If left untreated, feeding disorders may lead to aspiration, prolonged feeding times, cachexia, poor growth, hindered developmental performance, and increased medical and behavioral problems.[2-4] For the parents, the feeding process is often a significant source of anxiety and frustration.[5]There is no universally acceptable definition or classification of feeding disorders. A feeding disorder is identified when a child is unable or refuses to consume a sufficient quantity or variety of solids and liquids to maintain proper nutrition.[6] Feeding disorders can manifest as multiple food dislikes (food selectivity, 'pickiness'), partial to

total food refusal, difficulty in sucking, swallowing or chewing, vomiting, prolonged subsistence on inappropriate textures (inability to graduate to textured foods), delay in self-feeding, crying and tantrums at mealtimes, rumination, regurgitation and excessive salivation.[7] Feeding problems, though found in normal children, occur more in children with neurodevelopmental disabilities. Many interacting factors such as dysfunctional oral-motor activity, abnormal neurologic maturation and poor seating posture during feeding due to an unstable trunk may result in feeding dysfunction in children with neurodevelopmental problems.[3,8,9] Communication difficulties may interfere with request for food, expressions of hunger, or indications of food preference. Spasticity of the abdominal musculature can lead to increased intra-abdominal pressure thus resulting in gastroesophageal reflux disease (GERD). Delayed gastric emptying may result from impairment in the enteric nervous system in children with cerebral palsy which can increase the likelihood of GERD.[8]

In some children involuntary movements or seizure may interfere with feeding. Difficulty in feeding and stridor can also occur if there is marked hypotonia so that the tongue and jaw fall backwards, obstructing the airway.[10] Children with severe neurological handicap may have had repeated unpleasant experiences such as choking, vomiting and insertion of nasogastric tubes during feeding.

They may learn food aversion from these experiences which further worsen the feeding difficulty.[10]

In addition to the underlying neurological problem leading to the feeding disorder, caregiver's response to the child during meals may worsen the problem. Caregivers may employ variety of strategies to encourage eating such as distracting, coaxing, and reprimanding; allowing the child to periodically take a break from or avoid eating; and providing preferred food or toys.[10] These strategies have been reported to worsen behaviour of a majority of the children.[10]

Malnutrition has similarly been reported to cause various neurological disorders which often manifests as delayed mental and motor development.[11]
Neurological complications of malnutrition may therefore, worsen the pre-existing neurological disorder.
The management of the feeding problems is often over-looked in children suffering from neurological disorders.

Management requires a multi-disciplinary approach which consists of a team of specialists – psychologist, paediatrician, dietitian and a speech therapist. Such an interdisciplinary approach allows for a coordinated consultation with focus on the child as a whole and on its caregivers.[12]

Studies on the prevalence and management of feeding disorders in patients with neurological problems are few.

Most available studies are mainly on patients with cerebral palsy, neuromuscular diseases and autism. Sullivan et al[13] studied 377 children aged 4 – 13 years on the Oxford Register of Early Childhood Impairments with oromotor dysfunction. A validated questionnaire was sent to the parents of the children to assess the prevalence and severity of feeding disorders. Feeding problems were prevalent: 89% needed help with feeding and 56% choked with food; 20% of parents described feeding as stressful and unenjoyable. Prolonged feeding times (3h/day) were reported by 28%. Only 8% of participants received caloric supplements and 8% were fed via gastrostomy tube. The researchers did not examine the subjects neither did they assess their nutritional status to ascertain the impact of the feeding disorder on their growth.

A review of literature on feeding problems in patients with neuromuscular disorders by Engel-Hoek et al[14] shows that feeding and swallowing difficulties are prevalent. The difficulties often arise from weakness of the muscles and usually manifests as drooling of saliva, difficulty with chewing and swallowing, vomiting, choking during feeds, prolong meal times and low caloric intake.

An assessment of 100 children with cerebral palsy, aged 1 – 9 years for feeding problems in India by Gagil et al,[9] showed presence of oromotor dysfunction which affected their intake

of solid food in addition to prolonged feeding time.

They also found significantly higher rate of feeding problems in children with seizures as co-morbidity; low parental awareness of the presence of feeding problem and a significantly lower nutritional status when compared with age and sex matched controls.[9]

There is paucity of data on feeding disorders in patients with neurological disorders in Nigeria. Ogunlesi et al[15] reported 80.4% prevalence of undernutrition with 52% being severely undernourished, among children with cerebral palsy who were attending the neurology clinic in Sagamu. It was a retrospective study and feeding disorders were not evaluated.

Another retrospective study done in Zaria[16] on neurologically impaired children did not evaluate their feeding problems even though feeding difficulties were mentioned.

In this study we aimed to assess the presence of feeding disorders in children with neurological impairment at the Paediatric neurology clinic in the University of Benin Teaching Hospital, Benin.

Materials and methods

This is a descriptive cross-sectional study involving children with neurological disorders attending the paediatric neurology clinic of the University of Benin Teaching Hospital, Benin City, Edo State, Nigeria.

The Hospital has an 850-bed capacity and provides health care for residents within Edo State and the neighbouring States of Delta and Ondo. The study was carried out between July and September, 2017.

Study population

One hundred and fifty-four children between the ages of 3 months and 16 years who had a neurological disorder and accessing care in the neurology outpatient clinic were recruited consecutively. The neurology clinic holds three times in a week with an average attendance of 50– 75 patients per week

Tool for data collection

A semi-structured interviewer administered questionnaire was used in obtaining information from the parents/caregivers of the children. The questionnaire has three sections. Section A contained information on the biodata of the child. Section B contained information on the feeding history while Section C contained information on the neurological diagnosis and anthropometric measurements. Information on feeding such as difficulty with chewing, swallowing, lip closure, sucking and others were obtained. The weight of each child was measured using a mechanical bench scale (SALTER model 180 England) for those aged twelve months and below, and a mechanical floor scale (SECA model 761) for children above twelve months. The children were weighed with light clothing. Weight was recorded in kilograms to the nearest 0.1kilograms. The nutritional status was assessed using the WHO and CDC weight for age z scores. Children with z score between -2 and -3 standard deviation were classified as underweight while those less than -3 were classified as severely underweight. Children with weight for age greater than +2 were classified as overweight.

Data Analysis

The data obtained were entered and cross checked for errors. Data analysis was done using IBM Statistical Package for the Social Sciences (SPSS) version 19. Continuous variables were summarized using means and standard deviations while categorical variables were summarized using proportions. Frequency tables were constructed as appropriate. Associations between sociodemographic characteristics and presence of multiple feeding problems and nutritional status were done using Chi square test with the level of significance set at $p< 0.05$ at 95% confidence interval.

Ethics

Ethical approval was obtained from the University of Benin Teaching Hospital Ethics and Research Committee. Verbal consent was obtained from the parents and caregivers after explaining the essence of the study and the assurance of confidentiality and absence of harm to them.

Results

A total of 154 subjects which consisted of 83 (53.9%) males and 71 (46.1%) females were recruited for the study. The socio-demographic characteristics of the subjects are as shown in table 1.

Table 1: Sociodemographic characteristics of the subjects

Characteristic	Frequency (n = 154)	Percentage
Sex		
Male	83	53.9
Female	71	46.1
Age (months)		
1 – 60	117	76
61 – 120	21	13.6
121 – 180	15	9.7
>180	1	0.7
Gestational Age		
Pre-term	12	7.8
Term	135	87.7
Post-term	7	4.5
Birth Weight (n = 114)		
Low birth weight	21	18.4
Normal birth weight	74	64.9
High Birth weight	19	16.7

Majority (76%) of the children were within the age group of 1–60 months; the median age was 34±47 months with a range of 3–192 months. The neurologic diagnosis of the subjects is represented in figure 1.

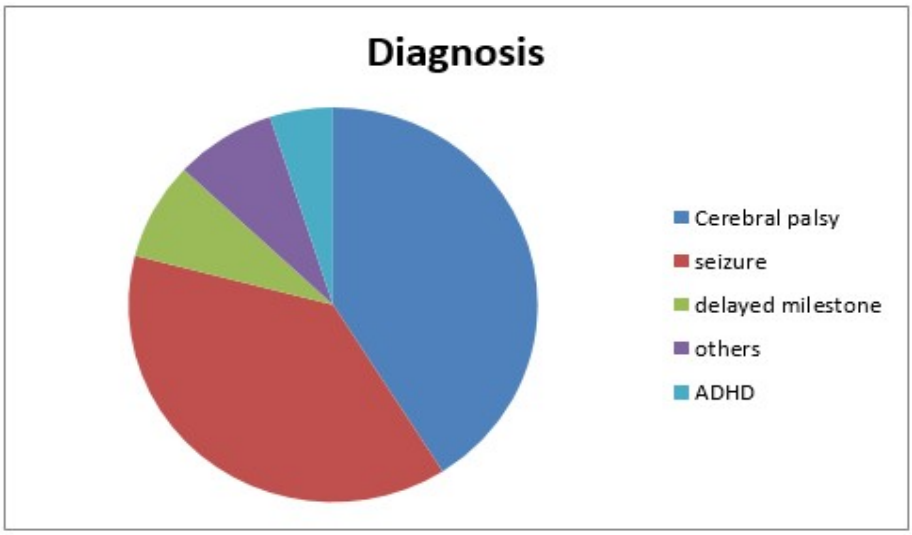

Figure 1: Neurologic diagnosis of the subjects

Cerebral palsy accounted for the highest contribution to the neurologic diagnosis of the study subjects which amounted to 41% of the total. Seizure disorders constituted 38% while the least representation was attention deficit hyperactivity disorder which constituted 4.5% of the total. Acute bilirubin encephalopathy, neurocutaneous syndrome, autism, down syndrome, mental retardation, pseudoparalysis and sciatica constituted the category of "others" which amounted to 8% of the total. The feeding pattern/characteristics of the children are represented in table 2.

Table 2: Feeding pattern of the children

Options	Frequency n = 154	Percentage
Types of food given		
Breastmilk only	4	2.6
Breastmilk + cereals	25	16.2
Cereals + family diet	38	24.7
Family diet	87	56.5
Who feeds child		
Mother	81	52.6
Father	5	3.2
Self	52	33.8
Maids	3	2.0
Multiple persons	13	8.4
Daily food frequency		
Twice	2	1.3
Thrice	45	29.2
Four times	62	40.3
More than four times	45	29.2
Feeding duration (mins)		
10 – 20	98	63.6
21 – 30	35	22.7
31 – 40	11	7.2
>40	10	6.5
Feeding experience		
Pleasant	98	63.6
Unpleasant	56	36.4
Multiple feeding problems		
Present	44	28.6
Absent	110	71.4

A greater proportion of the children (56.5%) were on family diet, 4 (2.6%) were on breastmilk only while others were on either a combination of breastmilk and cereals or family diet and cereals. Almost 34% of the respondents fed themselves while majority (52.6%) were being fed by their mothers. The total proportion of children being fed by either the father or maid amounted to approximately 5% while 13 (8.4%) were fed by multiple persons.

Most (40.3%) children were fed four times a day while only 2 (1.3%) children were fed twice in a day. Equal proportions (29.2%) of children were fed three times and more than four times a day. Each feeding period usually lasts for between 10 – 20 minutes in 98 children which amounts to 63.6% while feeding episodes can extend beyond 40 minutes in 10 (6.5%) children.

The feeding experience of the caregivers was pleasant for most (63.6%) of the mothers but the reverse was the case in 56 (36.4%) of the caregivers. Of the 56 caregivers with unpleasant feeding experience, it was tasking for 44 (78.6%) of them while the rest (21.4%) had a tiresome feeding experience. Multiple feeding problems were observed in 44 (28.6%) children. The various feeding difficulties recorded in this study are represented in table 3.

Table 3: Frequency of various feeding problems in the children

Feeding problem	**Yes** n(%)	**No** n(%)
Choking	26(16.9)	128(83.1)
Excessive Salivation	35(22.7)	119(77.3)
Regurgitation	22(14.3)	132(85.7)
Chewing difficulty	25(16.3)	129(83.7)
Difficulty opening mouth	11(7.1)	143(92.9)
Constipation	11(7.1)	143(92.9)
Difficulty in swallowing	17(11.0)	137(89.0)
Poor suck	10(6.5)	144(93.5)
Lip closure	17(11.0)	137(89.0)
Crying during feeds	23(14.9)	131(85.1)

Excessive salivation, choking, chewing difficulties, and crying during feeds ranked highest among the feeding problems encountered by the children studied.

The nutritional status of the children using the weight for age z score showed that 41 (26.6%) children were underweight, 102 (66.2%) had normal weight while 11 (7.1%) were overweight and none had severe acute malnutrition. Factors associated with multiple eating problems are as shown in table 4.

Table 4: Factors associated with multiple feeding problems in the subjects

Characteristic	Multiple feeding problem		χ^2	p value
Sex	**Yes**	**No**		
Male	17(20.5)	66(79.5)	5.773	0.016*
Female	27(38.0)	44(62.0)		
Age group (months)				
1 – 60	40(34.2)	77(65.8)	7.771	0.039*
61 – 120	3(14.2)	18(85.8)		
121 – 180	1(6.7)	14(93.3)		
>180	0(0.0)	1(100)		
Feeding experience				
Pleasant	16(16.3)	82(83.7)	19.802	<0.001*
Unpleasant	28 (50)	28(50.0)		
Diagnosis				
Cerebral palsy	29(46.0)	34(54.0)	18.224	0.001*
Seizure disorder	9(15.3)	50(84.7)		
Delayed milestone	2(16.7)	10(83.3)		
ADHD	0(0.0)	7(100.0)		
Others	4(30.8)	9(69.2)		

* $p < 0.05$

Gender, age group, feeding experience and neurological diagnosis were significantly associated with multiple eating problems. Multiple eating problems were significantlyhigher in female subjects and in children whose caregivers reported unpleasant feeding experience. Children within the age group of 1 – 60 months had a significantly higher chance of developing multiple eating problems when compared with other age groups. Among the various neurological diagnoses reported in the children, those with cerebral palsy were significantly associated with multiple eating problems. The association between underweight and some characteristics such as age group, sex, feeding experience and neurological diagnosis is shown in Table 5.

Table 5: Association between age, sex, feeding experience and neurological diagnosis with underweight

Characteristic	Presence of underweight		χ^2	p value
Sex	**Yes**	**No**		
Male	21(25.3)	62(74.7)	0.161	0.688
Female	20(28.2)	51(71.8)		
Age group				
1 – 60	37(31.6)	80(68.4)	6.195	0.097
61 – 120	2(9.5)	19(90.5)		
121 – 180	2(13.3)	13(86.7)		
>180	0(0.0)	1(100)		
Feeding experience				
Pleasant	22(22.4)	76(77.6)	2.404	0.121
Unpleasant	19(33.9)	37(66.1)		
Neurological diagnosis				
Cerebral palsy	26(41.3)	37(58.7)	15.66	0.006**
Seizure disorder	8(13.6)	51(86.4)		
Delayed milestone	2(16.7)	10(83.3)		
ADHD*	0(0.0)	7(100.0)		
Others	5(38.5)	8(61.5)		
Multiple feeding problems				
Yes	20(45.5)	24(54.5)	11.18	0.001**
No	21(19.1)	89(80.9)		

***ADHD Attention deficit hyperactivity disorder**
**** p<0.05**

Presence of multiple feeding problems and neurological diagnosis were significantly associated with underweight. Subjects with multiple feeding problems were more likely to be underweight. Similarly, subjects with cerebral palsy had higher propensity for underweight. About 41% of those with cerebral palsy were underweight.

Discussion

The two commonest neurological disorders in this study were cerebral palsy and epilepsy/seizure disorder. This finding compares with previous studies in Zaria, North West Nigeria,[16,17] Port Harcourt, Southern Nigeria[18] and Sudan.[19] Cerebral palsy ranked highest in this study and those from Zaria while epilepsy was the commonest disorder in Port Harcourt and Sudan. This finding may be because both morbidities share some common risk factors which include perinatal asphyxia, poorly treated intracranial infections and neonatal jaundice which are quite prevalent in developing countries.[18] In some patients both conditions may coexist and seizure features as a component of cerebral palsy.[15] The age range (range 3 months to 16 years) of the patients in this study is similar to other studies in Nigeria[17,18] and a study from Sudan.[19] Majority of the subjects were in the under-five age group which is similar to the studies in Zaria[17] and Port Harcourt.[18] This finding shows that neurological disorders cuts across all paediatric age groups. Its highest frequency in under-fives suggests that the risk factors for these disorders are more prevalent in early childhood. Additionally, the clinical manifestations of neurodevelopmental disorders become evident within this time frame when development is at its peak.[18] Default from the clinic owing to the cost of care and the chronicity of the disorders may also contribute to further reduction in clinic attendance and thus the reduced prevalence in late childhood and adolescence.[15]

Males have been reported from previous studies[16-19] to have a higher prevalence of neurological disorders which has also been corroborated by this study. The possible reason for this finding is not quite clear. However, neonatal infections and birth asphyxia which are risk factors for the two commonest causes of

neurological disorders in children (cerebral palsy and epilepsy) have been reported to be commoner in male infants.[20,21]

Self-feeding was reported in only about a third of the children. This shows a high dependence on parents and others for feeding of these children. This places an additional demand on the time available to parents, especially the mothers to attend to other duties including the care of the patient's siblings. This is even more challenging when meal times are prolonged owing to difficulty in chewing, swallowing, rumination and regurgitation.

These challenges among others may have contributed to the unpleasant feeding experience which was reported in 36% of the caregivers in this study. This finding is different from the report of Sullivan et al[13] in the United Kingdom where 20% of the parents described feeding as stressful and unenjoyable. This difference might be attributed to the difference in the population studied. Sullivan et al studied children aged 4 – 13 years in the register of early childhood impairments with oromotor dysfunction. This study's subjects were children aged 3 months – 16 years attending the paediatric neurology clinic. Socioeconomic status, occupation of the parents and availability of helping hands may either reduce or increase the burden of caregivers which will affect their perception of stress when faced with the challenge of feeding their children. The most frequent feeding difficulties encountered in the subjects were excessive salivation, choking during feeds and difficulty in chewing. Drooling at meal times may suggest difficulty with swallowing which often times lead to retention of food in the mouth. Choking during feeds usually indicate aspiration of contents during swallowing which results from absence or delay in the initiation of the swallowing reflex. Food can accumulate in the valleculae and pyriform sinuses if the swallowing reflex is not triggered which then leads to aspiration usually manifested as coughing or choking during feeds.[10,14] Difficulty in chewing may suggest a problem in the oral preparatory phase of swallowing which entails sealing of the lips, chewing, and the cupping of the bolus in a depression in the tongue.Abnormal oral sensation, involuntary movements, or learnt behavioural pattern can interfere with this phase. Patients with cerebral palsy often manifests with the above swallowing difficulties which often makes feeding a great challenge for parents and caregivers.[10] The authors were unable to access any study showing the relative frequency of the various feeding problems in patients with neurological disorders to compare with the above findings. Subjects with two or more feeding problems accounted for 28.6% of the total. The presence of multiple feeding problems was associated with female sex, unpleasant feeding experience in the caregivers, under-five age group and the diagnosis of cerebral palsy. The association between female sex and multiple feeding problems is not easily explicable. A possible reason could be the assumption that females naturally eat less than males, spend longer duration on their food and possibly exhibit higher food selective tendencies. The association between the age group of under-five and multiple feeding difficulties may be explained from the challenges normally faced by parents/caregivers in feeding young children. This age group has been reported to have feeding problems in the normal population.[22] Possible reasons include easy distraction during meals which may lead toreduced intake and prolong feeding time, preference for certain foods leading to pickyeating tendencies and small stomach capacity which may be associated with small frequent feeds and increased challenge for caregivers. The association between multiple feeding problems and the unpleasant feeding experience is understandable. The presence of multiple feeding problems increases the challenges of caregivers in assuring adequate nutrition in their children. Mealtimes become unpleasant which can lead to use of incentives and distractions to facilitate eating with no apparent success. Cerebral palsy among the neurological diagnoses has been significantly associated with feeding disorder. This has been well documented in previous studies.[2,3,9]The main aetiology of feeding difficulties in cerebral palsy children is oromotor dysfunction (OMD), leading to inadequate chewing and swallowing, requiring longer feeding session, and finally causing inadequate calorie intake.

The finding of underweight in a little more than a quarter (26.6%) of the subjects falls within the range of 22 - 72% reported by Safiza et al in a systematic review of the nutritional status of children with some neurological disorders.[23] The nutritional status of children with Down

syndrome, Autism spectrum disorders and cerebral palsy were reviewed and underweight was reported in children with cerebral palsy. This finding corroborates the association between underweight and cerebral palsy observed in this study. This finding is not unexpected as children with cerebral palsy have been shown from previous studies to have feeding problems[2,3,9] which often predisposes them to under-nutrition. It is equally expected that children with multiple feeding problems, as seen in this study, should have a higher tendency to develop under-nutrition. The more the feeding problems in a child, the less the quantity of food that is ingested, and the higher the frustration experienced by the caregivers during mealtimes. This will ultimately result in under-nutrition unless there is intervention by a team of specialists.

Conclusion

Feeding disorders occur in children with neurological impairments, especially in the under-five age group and those with cerebral palsy. Attention should be paid to feeding problems and nutritional status of children attending the neurology clinic and nutritional support offered to those affected.

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