A Study Of Feeding Problems In Children With Cerebral Palsy

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Abstract: Introduction: In children born before term development or in the presence of neurological compromise, problems are present with feeding & growth which can be related to an inadequate food intake, resulting from self-feeding impairment &oromotor dysfunction. Early intervention to correct the oromotor dysfunction is central to the management of children with neurological dysfunction. The purpose of present study is to find out the magnitude and extent of feeding dysfunction in patients of CP. Study design: prospective survey study Methods: 33 children with confirmed diagnosis of CP (7 – 96 month) were assessed for oromotor functions & interview of parent was taken for detailed feeding history and feeding habits. Feeding skill assessment was based on Gisel and Patrick's feeding behavior skill score. Score of 4 or less was regarded as normal, score of 5-8 was defined as marginal problem & score of 9 or more was regarded as inadequate feeding skills. Results & conclusion: Descriptive analysis of collected data was done which shows that feeding dysfunction is prevalent in CP children. Maximum inadequate feeding skills present in spastic quadri CP (75.0%) & with GMFCS V. Problems found were sucking and swallowing problems, inability to self feed (48.5%), prolong feeding time (mean feeding time was 22.42 minutes, SD = 13.44 confidence interval (95%), improper feeding positions, coughing and chocking during feeding (6.1%), vomiting (3.0%), recurrent chest infections, oral motor dysfunction, drooling, cry / strong extensor thrust during feeding. [Diwan S J et al NJIRM 2013; 4(1) : 78-86]

Key Words: cerebral palsy, oro-motor dysfunction, survey, G & P feeding skill score

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Introduction: A global figure of 335 million individuals with moderate & severe disabilities, of whom 70% are living in the developing world, has been estimated based on the UN population statistics for 2000.[1] In India, the prevalence of disability is estimated at 35 million individuals of whom 15 million are children.[2]

Cerebral Palsy describes a group of disorders of the development of movement & posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain which includes motor disorders accompanied by disturbances of sensation, cognition, communication, perception, and/or behavior, and/or by a seizure disorder.[3]

Feeding ,as a behavior is a complex ability we take for granted in normal infant, it just seems to naturally work & the child thrives. In children who are born before term development or in the presence of neurological compromise, we find problems are present with feeding & growth. Children may have multiple issues surrounding the incompetent ability to feed such as difficulty sustaining sufficient intake, maintaining growth and difficulty with digestion. These challenges force us to evaluate the complexities, which are occurring and preventing the child from having normal feeding and growth. Intravenous feeding, gavage feeding, transpyloric feeding, gastrostomy feeding and central lines are alternative methods of maintaining nutritional status in neurological compromised children.[4]

It is recognized that children with disabilities can have a poorer nutritional status than their non-disabled peers. Nutritional deficits and growth disorders in children with disabilities have been reported by a number of investigators [5,6,7,8]. The Oxford Feeding Study, which is the first large-scale epidemiological study of feeding and nutritional problems in disabled children with neurological impairment, states that feeding problems in children with neurological impairment are indeed common and severe & are a cause of much concern to parents [9]. Feeding difficulties were identified as a risk factor for vulnerability to inadequate nutritional status among children with disabilities, living in Dharavi, a slum in Mumbai , India (2003)[10]. The growth failure can be related to an inadequate food intake, resulting from self-

feeding impairment &oromotor dysfunction. Children with CP and other neuro-disabilities often have decreased postural control secondary to abnormal muscle tone & movement patterns that exacerbates their feeding / swallowing disorders[11].It was described that feeding the child with a disability as stressful and not enjoyable[12].

In view of such diverse complications, it is apparent that early intervention to correct the oromotor dysfunction is central to the management of children with neurological dysfunction.

The purpose of this study is to find out the magnitude and extent of feeding dysfunction in patients of CP coming to our department so that early measures can be started to correct the oromotor dysfunction and further complications can be prevented.

Aims & objective of the present study are:

1. To find out the magnitude and extent of feeding problems in children with cerebral palsy coming to *PaediatricPhysiotherapyDepartment*, SBB college of physiotherapy, VS hospital, Ahmedabad, Gujarat, India on OPD basis.
2. To find out the effect of severe neurological dysfunctions on the feeding issues.
3. To find out the commonly used position for feeding in children with neurological dysfunction.
4. To find out the total time consumed per feeding session of a child with cerebral palsy.
5. Analysis of the type of food taken by cerebral palsy children.

Material and Method: A prospective survey study was carried out for 1 year on the patients of CP coming to OPD of pediatric physiotherapy department of SBB college of physiotherapy. Written informed consent was obtained from the mothers & additional verbal consent was obtained from those children who were old enough to understand the purpose of study.

A convenient sample of 33 children were recruited with inclusion criteria of: Patients of CP, all clinical types & global developmental delay, irrespective of the sex and age; Stable patients (coming to OPD regularly); Mothers ready to discuss the problem and participate in the study . The exclusion criteria was : Any structural problem in OM region, Acute fever, Acute cough and cold, Patients not eating at his/her own pace under observation, Any cranial nerve affection associated with feeding function.

Data was collected by the combination of interview method of the mothers of cerebral palsy patients and structured observation of the feeding session of cerebral palsy patient. A frame of interview questions were prepared with combination of open and close ended questions about the detailed feeding history and feeding habits of child . Mothers ready to participate in the study were asked to bring the basic food in the preferred eatable form, what the patient is regularly taking with his own utensils, if any. A non-distractable, well ventilated and well lighted room was selected for the observation of feeding session. Oral motor and feeding evaluation was concurrently conducted during observation when the child was being fed. Feeding assessment was preferably taken during a natural feeding time to get an accurate picture of the drive to feed.

Extra oral and intra oral examination were undertaken at a separate time in order to examine the configuration and the integrity of the oral structures. Severity of CP was assessed according to the GMFCS [13].

Feeding skill assessment was based on Gisel and Patrick's feeding behavior skill score[14]. Score of 4 or less was regarded as normal, score of 5-8 was defined as marginal problem & score of 9 or more was regarded as inadequate feeding skills[14].

In the present study 33 children (21 M,11 F) were assessed for the oromotor dysfunctions with the chronological age range of 7 month to 96 months. Data collected was analyzed by unpaired't' test to compare two variables.

Results: Of the 33 children assessed for oromotor dysfunction, 51.5% were able to self- fed if

provided with the food while, 48.5% were depended on mother for the feeding. Mothers were the primary feeder preferred by the CP children in the dependent ones. According to the subjective statement of the mothers, volume of feeding is decreased & more tantrums were noted on being fed by any other guardian.

TABLE 1: Distribution of length of feeding session

Feeding time (minutes)	Frequency
1 – 15	14
16-30	10
31-45	7
46-60	2

The analysis of the preferred position used by cerebral palsy patients shows that 60.6% of the patient studied were using independent sitting for feeding. More disabled patients were being fed either supine in the lap or maximally supported sitting in lap.

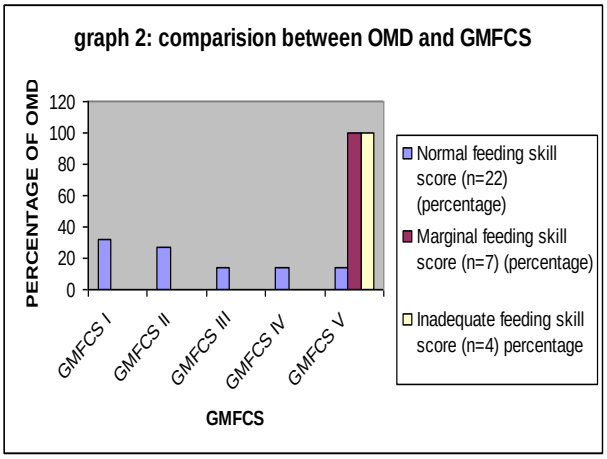


TABLE 2: Relationship of OMD with the type of CP, duration of feeding session, type of diet and GMFCS

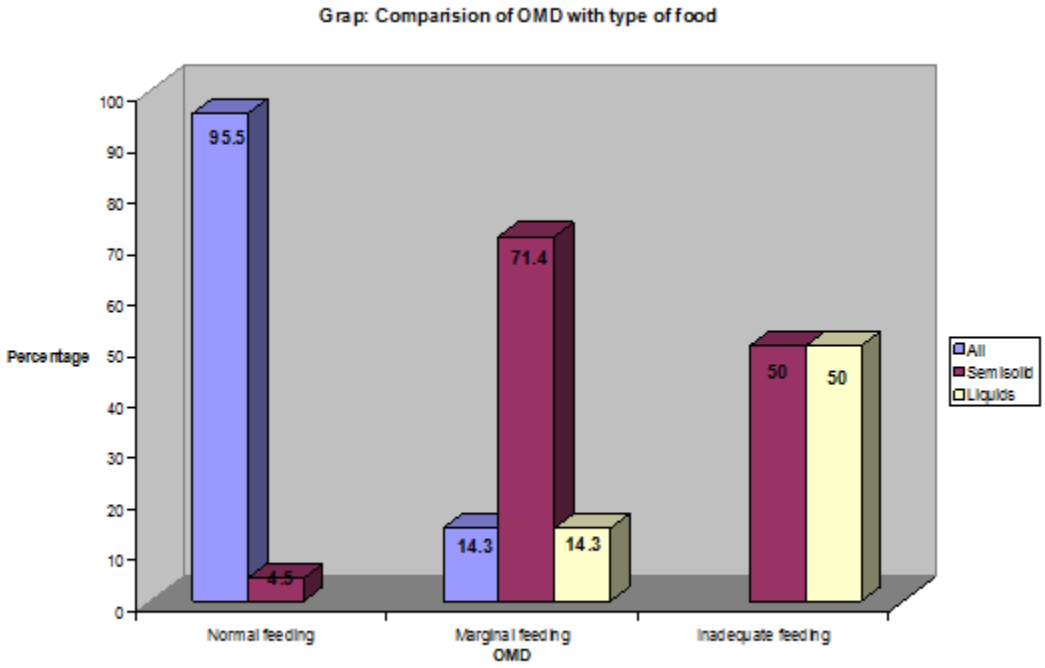
Parameter	Total (n=33) (number)	Normal feeding skill score (n=22) (percentage)	Marginal feeding skill score (n=7) (percentage)	Inadequate feeding skill score (n=4) (percentage)
Typeofcerebralpalsy				
Spastic Diplegic	9	40.9	28.6	-
Spastic Quadriplegic	2	9.1	42.9	75.0
Hemiplegic	2	9.1	-	-
Dystonic	3	13.6	-	-
Hypotonic	2	9.1	-	-
Developmental Delay	4	18.2	28.6	25.0
GMFCS				
GMFCS I	7	31.8	-	-
GMFCS II	6	27.3	-	-
GMFCS III	3	13.6	-	-
GMFCS IV	3	13.6	-	-
GMFCS V	3	13.6	100.00	100.00
Diet				
All	21	95.5	14.3	-
Semisolid	1	4.5	71.4	50.0
Liquids	-	-	14.3	50.0

TABLE 3: Statistical Analysis Using 't' test between two variables

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std.	Std. Error	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Clinical Type - G & P score	- 0.94	3.69	0.64	-2.25	0.37	-1.462	32	0.153
Pair 2	GMFCS - G & P score	- 0.76	2.26	0.39	-1.56	4.53E-02	-1.922	32	0.064
Pair 3	Drooling –G & P score	2.00	3.24	0.56	0.85	3.15	3.546	32	0.001
Pair 4	Type of food - G & P score	2.67	2.59	0.45	1.75	3.59	5.905	32	00

Desire to feed was verbally conveyed by 51.5% of children while gesture was used by 24.2% children. However children with severe disabilities were just cried to convey that they are hungry or may be crying was taken by mothers that the child may be hungry

Maximum marginal and inadequate feeding skill scores are clearly seen in patients of GMFCS level V (Graph 2).



Relationship of OMD with the type of CP, duration of feeding session, type of diet and GMFCS

Table 3 shows that there is significant association between G & P score and drooling ($p<0.005$) with df = 32 & there is significant association between G & P score and type of food ($p < 0.005$) with df=32. GMFCS is not having any significant association with clinical type while GMFCS is having borderline association with G & P score, not truly statistically significant.

Discussion: Nutritional deprivation in children with CP is summation of several factors which directly or indirectly results in reduced intake. OMD is one of the most significant factors amongst them. Feeding problems observed in the present study included sucking and swallowing problems, inability to self feed, inadequate feeding skills, regurgitation, coughing and chocking during feeding, recurrent chest infections, oral motor dysfunction, vomiting, cry/extensor dystonia during feeding, drooling, hypertonic tongue & inadequate tongue lateralization.

However, feeding problems were not present in all children studied. Prevalence of feeding problems was not that high (33.3%) in present study, in contrast to the other researchers[15] which may be attributed to lack of specific age limitation or small sample size.

Feeding Problems In Different Types Of CP: Maximum inadequate feeding skill score was attained by spastic quadriplegic cerebral palsy (SQCP) patients (75%) while maximum normal feeding skill score was attained by spastic diplegic CP (40.9%)

Feeding problems have been observed in 40-90% children with cerebral palsy with severe problems existing for quadriplegic cases.

SQCP patients demonstrate arching of the body compromising alignment of head and neck during feeding; overflow stiffening and posturing; postural instabilities; irradiation of muscle tone in oral structures interfering with range of movement in tongue, jaw, lips and cheeks; improper alignment of oral structures; impaired coordination of breathing and sucking; residual oral reflexes; strong protrusion or retraction; deficient proprioceptive, taste, tactile and temperature awareness.

In the present study SQCP have most severe OMD similar to another study[15,16]but in this study hypotonic patients are not having poor OMD, while diplegic and hemiplegics are having normal feeding skill score, not even mild OMD. Stallings et al identified in a clinical study that children with hemiplegic cerebral palsy were significantly more likely ($p<0.01$) than children with diplegic cerebral palsy to have oral motor difficulties that can impact on food intake[17].

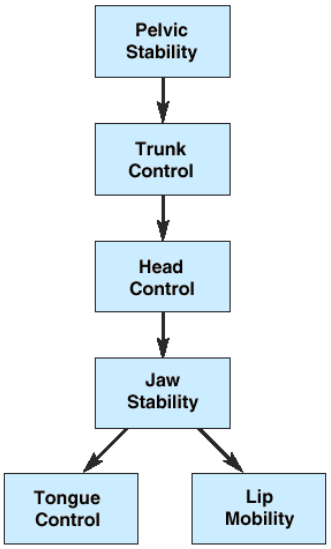
Oromotor problems in hypotonic children are attributed to inactive lips, cheeks and tongue muscles. The lack of early hand-to-mouth and toy-to-mouth play contributes further to sensory discrimination deficits. As a result of oral hyposensitivity, the child may not feel food and saliva in mouth. The use of head and neck hyperextension with tongue retraction creates alignment problems that interfere with motor control & may lead to oral hypersensitivity.

Dahl et al found poor nutritional status in dystonic form of cerebral palsy[18]. Fluctuating muscle tone is also reflected in oral motor mechanism. Lip, cheek and tongue retraction are associated with head and neck hyperextension. The child will attempt to cope with lack of oral control by using an exaggerated jaw closure, lip pursing, and tongue thrusting. The child may also gain stability by holding the tip of the tongue against the hard palate. Oral hypersensitivity may be expressed as involuntary tonic biting with a generalized increase in whole body extension. Eating is often the most difficult activity to manage, both for the dystonic child and the adult as the child tends to overreact to the presentation of food & hence adequate time is needed to coordinate swallowing with breathing, particularly when liquids are offered. Facial expressions are often misinterpreted because the fluctuating tone creates a grimacing effect.

Feeding Problems According To Gmfcs Levels: Poor feeding skill score was significantly high in patients of GMFCS V, a severely impaired functional ambulation potential ($p<0.005$) (Table 3).

Previous researchers show that there was a significant correlation between severity of motor impairment reported and a range of feeding problems. Children unable to walk or who required an aid and helper to walk were much more likely to have problems eating and swallowing lumpy food & needed food mashing or liquidizing[19] , which is supporting our study.

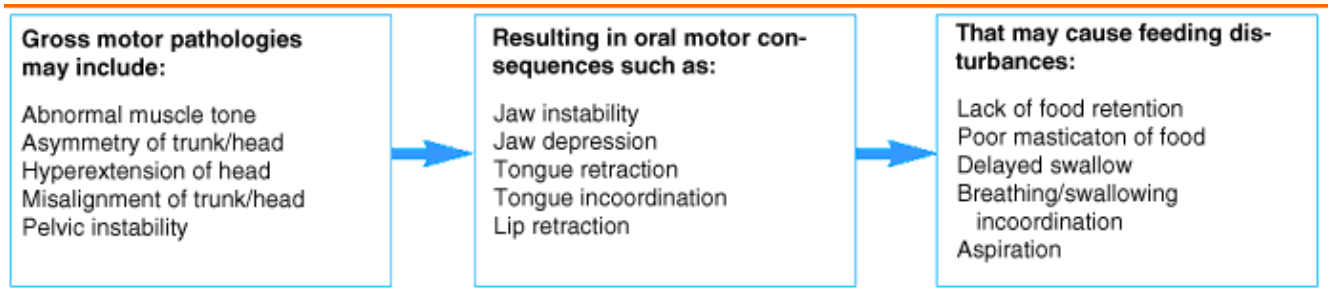
Graph 2 shows the association between OMD and GMFCS. Studies shows that there is a significant correlation between the severity of motor deficit and dysphagia[20,21] and that feeding problems are common in children with cerebral palsy[7,18].



Feeding Position: Independent sitting on floor was the commonly used feeding position in children with neurological dysfunction in our study (60.6%) while 24.2% pts were being fed in supine position in mother's lap which is not following the recommended head posture for safe swallow (chin tuck).

Safety and efficiency are enhanced with upright positioning and the use of a chin-tuck head posture, which allows food moving from the mouth through the pharynx into the esophagus to be directed away from the airway. This position also provides greater stability of the mandible for improved suck/swallow in the infant. However, maintaining this head posture is problematic in children with neurodisabilities[22].

The child's body should be positioned so that symmetry is achieved. Stabilizing the pelvis is fundamental to this posture[23], and providing foot support adds to the stabilization. If the stability is achieved at the pelvis, then improved control in the rest of the body will be reflected in better functioning[23,24,25].



Feeding time: Studies of children with CP have identified that the time taken to complete a meal is frequently much longer than for non-disabled children .

Prolonged feeding time for children with disabilities has been observed in smaller case series and, in addition, it was observed that such prolonged feeding times failed to compensate for the severity of the feeding impairement[26.]

In the present study the mean duration of feeding session was 22.42 minutes. Present study could not comment on the total time in a day for feeding a disabled child as the answers collected were not very specific and more subjective.

Previous researchers shows that , on average mothers of children with disabilities spend 3.5 hrs per day feeding their child compared with 0.8 hrs of mothers with non-disabled children; some mothers spend over 7.5 hrs a day trying to feed their child with disabilities[27].

In another study feeding took parents four to six hours a day & it was punctuated by repeated spillage of food, bouts of cough, choking or regurgitation with mean duration of feeding session 31.5 minutes (range 10-60 minutes)[28]. Even long meal times do not compensate for the severity of these children's feeding impairment & they frequently become malnourished[9].

Sullivan et al in their study with much larger series of children has confirmed these observations and suggests that feeding time can be used as a reliable measure of the severity of feeding impairment. If a mother is spending 3 or more hours per day feeding her child with a disability then serious thought should be given to the introduction of tube feeding[9].

In depth interview of those parents of cerebral palsy whose feeding skill score was low, revealed that instead of being an enjoyable family event, meal was stressful and time consuming for these children and those caring for them.

A lack of time for adequate feeding care was a barrier experienced by many mothers of children with feeding problems. In poor communities such as Dharavi, finding free time for additional care activities is complicated by other competing priorities for parents[10].

Few other studies have investigated the lack (or perceived lack) of interest in food by children with disabilities.

Type of food: In the present study, 95.5% patients with normal feeding skills were eating all the types of food while 71.4% patients with marginal feeding skills were taking semisolid and 14.3% were taking liquids. 50.0% of Children with inadequate feeding skills were taking semisolid and liquids

Severity of OMD had significant effect on consistency of food consumed by cerebral palsy patients. ($p<0.005$) (Table 3) There was a correlation between severity of motor impairment reported and a range of feeding problems but it is not statistically significant in our study (Table 3) Children unable to walk or who required an aid and helper to walk were much more likely to have problems eating and swallowing lumpy food & needed food mashing or liquidizing ($p<0.0001$)[9] .

Poor OMD in cerebral palsy children prompted the parents to prefer liquid and semisolid meshed diet to feed them. It has been recommended that children with cerebral palsy who have poor oral motor function should be offered food that they can eat with least frustration or distress[29].

Drooling: Results of the previous studies suggest that children with CP who drool have poorer functional skill scores, lower nonverbal intelligence scores, more severe oral motor involvement & a tendency to swallow less frequently than children with CP who don't drool[30].In our study also we found that drooling is highly significant with lower feeding skill scores ($p<0.005$) (Table 3).

Studies show that children with CP do not produce excess saliva[31,32]. Davis et al found significantly lower stimulated parotid flow rates in children with moderate to severe head and neck involvement due to CP than in control participants[31].

Limitations Of The Study: Lack of definite age limitation, We diagnosed, OMD and feeding skills by observation of feeding sessions but video recording of structured feeding sessions has been found to be a good method for diagnosing presence of OMD[33], video swallowing study is more standardized method.

Observation of feeding session was done at clinical set-up with privacy but there was lack of observation of feeding session in home visit (especially pts with poor feeding skill score patients) which might have environmental effects on feeding skill score. Validity of domains within the assessment questions were not confirmed by comparison with responses to other well-validated instrument.

Conclusion : The present study concludes that the feeding problems in children with Cerebral Palsy are prevalent. Attention towards oromotor dysfunctions and postural alignment is strongly needed. In the child with Cerebral Palsy the alignment and the stability of the oral structures for feeding may be compromised by abnormal muscle tone and movement patterns. Further this study states that children with severe locomotion disability show severe oromotor dysfunction. Poor feeding skills are highly associated with increase drooling and more liquidized food. Feeding dysfunctions are a considerable source of stress to these children and their care givers. Thorough assessment for oral motor function, feeding problems and nutritional status of Cerebral Palsy children is indicated in order to start timely nutritional rehabilitation and oro-motor stimulation therapy which can improve their nutritional status and the quality of life. Parental

responses about the feeding difficulties were useful in identifying feeding problems.

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