

Nutritional and Feeding Problems among Children with Cerebral Palsy

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ABSTRACT

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Objectives: The study was conducted to identify nutritional and feeding problems among children with cerebral palsy

Methods and Material: 75 consecutive children with cerebral palsy, from a Paediatric Neurology outpatient clinic were selected. An interview schedule was used to assess feeding problems. Assessment proforma, weighing machine and measuring tape were used to assess physical measurement for identifying nutritional problems.

Results and Conclusions: 75.9% of the cohort had malnutrition, 64% had wasting and 70.7% had stunting. 69.2% of 2-5 yrs olds, 80% of 5-8 yr olds and 62.5% of 8-12 yr olds were underweight. 5.3% were overweight. 100%, 50% and 67.5% of choreoathetoid, hemiplegic and quadriplegic children were underweight respectively. Stunting was marked in the 8-12 year group and in diplegics. Feeding problems were more common in the 5-8 year group. 95% had a slow intake. 95% had a slow oral intake. 76.5% could not self feed, 60% spilt food, 45% rejected solids, 35% had frequent aspiration, 35% had difficulty chewing food, 35% had difficulty in spoon feeding, 25% had swallowing problem, 25% could not drink from a cup and 15% had vomiting. Clinical signs of nutritional deficiencies were also evident in the study group. There was statistically significant association between feeding problems and stunting, i.e. feeding problems were more in the group of cerebral palsy children who were having stunting. Maternal ignorance regarding feeding of cerebral palsy children was more in mothers from low socio- economic status. Children with Spastic quadriplegic Cerebral palsy had more feeding problems.

Keywords: Cerebral Palsy, Feeding Problems, Malnutrition, Underweight, Stunting

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Key Messages: In the light of this study parents of children with Cerebral Palsy should be educated for better feeding practice. Use of gastrostomy in children with feeding problems should be advocated. Future studies should focus on effect of early nutritional intervention especially better feeding techniques and maternal education regarding feeding techniques.

INTRODUCTION

Previous publications reviewed the epidemiology, pathogenesis, and treatment of malnutrition which occurs as a comorbidity in neurologically impaired children.^{1,2} Under nutrition and overweight lead to increased health problems and diminished participation in home and school.³ Adequate nutritional support may restore linear growth, normalize weight and prevent infections in these children.^{4,9} Height-for-age and weight-for-age growth standards of neurologically impaired children are known to be lower than those of the reference population.¹⁰⁻¹⁵ Children with cerebral palsy consume less dietary energy.¹⁶⁻¹⁷ The objective of

the present study was to identify nutritional and feeding problems among children with Cerebral Palsy (CP).

SUBJECTS AND METHODS

Clearance was obtained from the Hospital Ethical Committee and informed consent was obtained from each parent or guardian at the time of interview. 75 consecutive children of either sex, with Cerebral Palsy of 2-12 year age who attended a Pediatric Neurology outpatient service were sampled; their nutritional assessment done and parents were interviewed to identify feeding problems in these children. Exclusion criteria included children with coexisting chronic kidney, heart and gastrointestinal diseases, or those who had other congenital malformation that could independently affect food intake like cleft lip and or palate. A descriptive design was used. In this study, nutritional problems meant wasting, stunting, protein energy malnutrition, and nutritional deficiencies. Feeding problems referred to difficulty in chewing, difficulty in swallowing, inability to feed independently, rejection

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of solid foods, slow oral intake, spillage during eating, disability in spoon feeding and cup drinking, coughing with meals, vomiting, and aspiration.

The tools used for the study were assessment proforma, structured interview schedule, weighing machine, measuring tape and scale. Technique used for data collection was observation, anthropometric measurements, structured interview and review of clinical records.

Each patient's caregiver/mother participated in a structured interview; socio-demographic data and presence of feeding problems were collected from the interview. Nutritional problems were identified using assessment proforma which included both anthropometric measurements and clinical signs of nutritional deficiencies. The feeding problems assessed were poor sucking, spitting out most of the feeds, always choking while feeding, inability to chew, need for special instruments such as tubes or special type of cup or spoon for feeding and refusal of feeds. An interview schedule with 9 items and a score of 18 was used to assess knowledge of mothers regarding the nutrition and feeding of children with Cerebral palsy. Proportionate weight was given to each area. Subject experts checked content validity of the tool. The tool was translated into Malayalam and then retranslated into English to validate the language. The interview was completed in one or two sessions as dictated by the child and parent's cooperation.

All children were weighed with the same standardised equipment. The scale was zeroed before each measurement. The children were weighed in light under clothing only, with a dry diaper (if incontinent), and without shoes and braces. The stature was measured using a stadiometer in most children. In non ambulant children the recumbent stature was measured from vertex to heel and not along the body contours using a measuring board.

DEFINITIONS

Children were classified as having Protein Energy Malnutrition (PEM), based on weight for age (WFA) as per IAP classification. They were classified into groups for 'Height for Age' as per Waterlow's classification for stunting. They were classified as per Waterlow's classification for wasting based on 'Weight for Height' (WFH).

Anthropometric calculation was done according to following formulas: Height for age: $[\text{observed height}/$

$\text{median height (same age and sex)}] \times 100$: Weight for age: $[\text{observed weight}/ \text{median weight (same age and sex)}] \times 100$: Weight for height: $[\text{observed weight}/ \text{median weight (same height and sex)}] \times 100$.

According to Water low classification, first degree stunting means percentage of body height between 90 and 95% compared with the reference height for the age. Second degree stunting means percentage of body height between 85 and 90%. Third degree stunting means percentage of body height less than 85%.

Ideal body weights for height, was derived by comparing actual weight with the 50th centile weight for a child of the same height who is on the 50th centile for height. Children were classified as "wasted" when their percentage of body weight was lower than 90% compared with reference values.

Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared, rounded to one decimal place. BMI-for- age between the 85th and 95th percentile and more than 95th centile according to the CDC/NCHS 2000 National Health and Nutrition Examination Survey was taken as overweight and obese respectively. Low socioeconomic status was defined as less than a score of five on the modified Kuppaswamy scale (2007).

RESULTS

Majority (52%) of children in the study group were in the age group of two to five yrs. 60% of these were males. Duration of illness in 45.3% of children was between three and six years. 26.7% had duration of more than six years and 28% more than three years. Among the 75 children, majority (53.3%) had Spastic quadriplegic Cerebral Palsy, 34.7% had Diplegic Cerebral Palsy, 8% had Hemiplegic Cerebral Palsy and four percent were Choreo-athetoid. In the study group 74.7% had seizures, 18.7 percent had hearing deficit, 88% had speech problem, 96% had motor deficit, 60% had drooling, 38.7% had constipation and 89.3% had mental retardation. 82.7% of children were undergoing physiotherapy and 28% were undergoing speech therapy. 32% were on antispasticity agents, 74.7% were on antiepileptics, 21.3% were on vitamin supplements and 97.3% were on regular follow up. None among the cohort were on tube feeds or had access to tube feeds at anytime for more than two weeks.

Regarding nutritional problems identified in the group 75.9% had malnutrition. 64% had wasting and 70.7% had stunting. 69.2% of children of age two to five

years, 80% of age five to eight yrs and 62.5% in the age eight to twelve yrs were underweight. Stunting was marked in the eight to twelve year group and in those with diplegic Cerebral Palsy. 5.3% were overweight based on body mass index.

Among children with hemiplegic Cerebral Palsy, 50% were under weight and 16.7% were overweight. In the group of Spastic quadriplegic Cerebral Palsy, 67.5% were underweight and 5% were overweight. 100% children with Choreo-athetoid Cerebral Palsy were underweight. And, among children with Diplegic Cerebral Palsy 76.9% were underweight and 3.9% were overweight.

Table-1 shows the age-wise distribution of children according to stunting, wasting and PEM. 25.6% of children in the age group of two to five years had Grade II stunting. 40% children between five and eight years had Grade I stunting and 40% had Grade II stunting. Among the children between eight and twelve years, 25% had Grade III stunting. Grade I wasting was the major finding among 41% of children with age between two and five years. Grade II PEM was present in 45%, and Grade IV PEM was present in 18.8% of children in the age group of five to eight years (Table 1). About 25% of children with Grade II wasting and 12.5% of children with Grade III wasting were in the age group of eight to twelve years. Grade II PEM were present in 45% of children in the age group five to eight years. Among the children in the age group eight to twelve years 18.8% had Grade IV PEM.

Nutritional problems	Age in years						Chi square	P					
	2-5 n=39		5-8 n=20		8-12 n=16								
	f	%	f	%	f	%							
STUNTING	Normal	14	35.9	3	15.0	5	31.3	16.057 df=9	0.066				
	Grade I	8	20.5	8	40.0	4	25.0						
	Grade II	10	25.6	8	40.0	3	18.8						
	Grade III	7	17.9	1	5.0	4	25.0						
WASTING	Normal	14	35.9	7	35.0	6	37.5			6.736 df=9	0.665		
	Grade I	16	41.0	7	35.0	4	25.0						
	Grade II	6	15.4	4	20.0	4	25.0						
	Grade III	3	7.7	2	10.0	2	12.5						
PEM	Normal	12	30.8	3	15.0	3	18.8					12.540 df=12	0.403
	Grade I	10	25.6	5	25.0	4	25.0						
	Grade II	12	30.8	9	45	3	18.8						
	Grade III	4	10.3	3	15	3	18.8						
	Grade IV	1	2.6	0	0	3	18.8						

Nutritional problems	Type of Cerebral palsy								Chi square	P					
	Hemi-plegic CP n=6		Spastic quad-riplegic CP n=40		Choreo-athetoid CP n=3		Diple-gic CP n=26								
	f	%	f	%	f	%	f	%							
STUNTING	Normal	5	83.3	8	20.0	1	33.3	8	30.8	16.057 df=9	0.066				
	Grade I	0	.0	15	37.5	0	.0	5	19.2						
	Grade II	1	16.7	11	27.5	2	66.7	7	26.9						
	Grade III	0	.0	6	15.0	0	.0	6	23.1						
WASTING	Normal	3	50.0	15	37.5	1	33.3	8	30.8			6.736 df=9	0.665		
	Grade I	1	16.7	14	35.0	0	.0	12	46.2						
	Grade II	2	33.3	7	17.5	1	33.3	4	15.4						
	Grade III	0	.0	4	10.0	1	33.3	2	7.7						
PEM	Normal	12	30.8	3	15.0	3	18.8	12	30.8					12.540 df=12	0.403
	Grade I	10	25.6	5	25.0	4	25.0	10	25.6						
	Grade II	12	30.8	9	45.0	3	18.8	12	30.8						
	Grade III	4	10.3	3	15.0	3	18.8	4	10.3						
	Grade IV	1	2.6	0	.0	3	18.8	1	2.6						

Table-2 shows association between type of cerebral palsy and nutritional problems. 100% of Choreoathetoid, 50% of Hemiplegic and 67.5% of quadriplegics were underweight. However there was no statistically significant association between the type of cerebral palsy and stunting wasting and PEM.

Feeding problems	Age in years						Chi square	P
	2-5 n=39		5-8 n=20		8-12 n=16			
	f	%	f	%	f	%		
Difficulty in chewing	7	17.9	7	35.0	2	12.5	3.236	0.198
Difficulty in swallowing	12	30.8	5	25.0	6	37.5	0.654	0.721
Cough during meals	12	30.8	4	20.0	2	12.5	2.315	0.314
Vomiting	5	12.8	3	15.0	1	6.3	0.696	0.706
Aspiration	12	30.8	7	35.0	2	12.5	2.541	0.281
Spillage during eating	15	38.5	12	60.0	10	62.5	3.864	0.145
Rejection of solid foods	12	30.8	9	45.0	2	12.5	4.416	0.110
Slowness in oral intake	28	71.8	19	95.0	10	62.5	5.935	0.051
Difficulty in self feeding	30	83.3	13	76.5	6	46.2	6.963	0.031
Difficulty in spoon feeding	8	20.5	7	35.0	2	12.5	2.782	0.249
Difficulty in cup drinking	10	25.6	5	25.0	3	18.8	0.310	0.856

Table-3 shows that there was significant association between difficulty in self feeding and age of the children. More feeding problems were in the age group of five to eight years. The major identified feeding problem in this age group was slowness in oral intake (95%). Other problems noted were difficulty in self feeding (76.5%), spillage during eating (60%), rejection of solid foods (45%), aspiration (35%), difficulty in chewing (35%), difficulty in spoon feeding (35%), difficulty in swallowing (25%), difficulty in cup drinking (25%), cough during meals (20%), and vomiting (15%)

Feeding problems	Type of CP				Chi square df=3	P
	Hemi-plegic n=6	Spastic Quad-riplegic CP n=40	Choreo-athetoid CP n=3	Diple-gic CP n=26		
	%	%	%	%		
Difficulty in chewing	33.3	32.5	.0	3.8	9.038	0.029
Difficulty in swallowing	33.3	45.0	.0	11.5	9.686	0.021
Cough during meals	.0	40.0	.0	7.7	12.247	0.007
Vomiting	.0	22.5	.0	.0	8.949	0.030
Aspiration	.0	37.5	.0	23.1	5.603	0.133
Spillage during eating	50.0	47.5	100.0	46.2	3.241	0.356
Rejection of solid foods	16.7	45.0	.0	15.4	8.601	0.035
Slowness in oral intake	50.0	87.5	100.0	61.5	9.052	0.029
Difficulty in self feeding	80.0		87.5	33.3	61.5	7.848 0.049
Difficulty in spoon feeding	.0		42.5	.0	.0	19.235 0.001
Difficulty in cup drinking	.0		40.0	.0	7.7	12.247 0.007

Table-4 shows that there was significant association between feeding problems and the type of Cerebral palsy. Children with Spastic quadriplegic Cerebral Palsy had more feeding problems than children with other types of Cerebral Palsy.

The relation of feeding problems and nutritional consequence was statistically analysed. There was significant association between feeding problems and stunting (p=0.041).

10.7% of the cohort had thin hair, four percent easy pluckability of hair, 24% had pallor, eight percent had angular stomatitis and none had oedema, glossitis or gum bleeding or petechiae. 12% had frontal bossing and 6.6% had beading of ribs. None had bow legs.

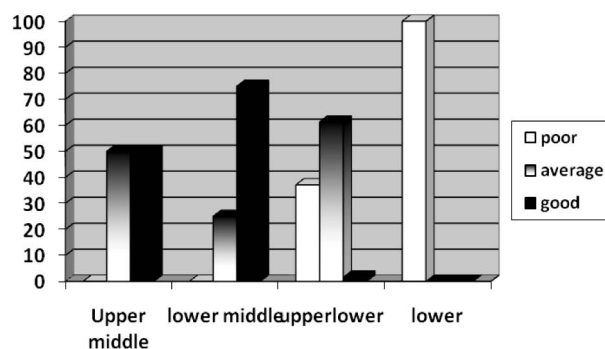


Figure 1. Association between socioeconomic status and knowledge of mothers

Figure-1 shows that there was statistically significant association between socioeconomic status and knowledge of mothers regarding feeding a child with Cerebral Palsy. Knowledge level was low in mothers from low socio-economic group.

DISCUSSION

Majority of children with cerebral palsy had malnutrition. Stunting was more marked as the child grew older. Stallings (1993), documented that about 30% of children with cerebral palsy were under nourished, 14% had overweight, 23% of the children had stunted growth.¹⁰ In a study from Taiwan, 41.3% of the recruited Cerebral palsy children had under nutrition.¹⁸ This is in contrast to 75.9% of our cohort who had malnutrition, 5.3% who had Body Mass Index greater than normal, 64% who had wasting and 70.7% who had stunting. This difference could also reflect the prevalence of obesity, Protein Energy Malnutrition, stunting and wasting in the Kerala population. In a recent study among the general paediatric patients (which excluded cerebral palsy, diarrhea and other serious illnesses) admitted to the hospital in which the present study was conducted, the prevalence of Protein Energy Malnutrition was 27.5 %, stunting 48%, wasting 50% and two percent had Body Mass Index more than normal.¹⁹ In the present study, cerebral palsy children had clearly worse nutritional status compared to the general pediatric population in the same hospital; and the better nutritional status of cerebral palsy children in the report by Stallings probably reflects the better nutritional status of the population she studied. The fact that 70.7% of our sample was stunted shows the prevalence of chronic under nutrition in our group. This may be a reflection of the social status in the country and the population to which this government hospital caters as the prevalence of stunting in the general pediatric patients was 48%.

The severity of malnutrition in the study group was seen to increase with the duration of neurological impairment as stunting was marked in the eight to twelve year age group despite the fact that the older children had better feeding skills. None of our children had a gastrostomy in spite of the feeding problems; as our patients do not seem to accept gastrostomy as a remedy when offered to them.

Spastic quadriplegic cerebral palsy and hypotonic patients had significantly poor feeding skill score in an Indian study on 100 children with cerebral palsy and was akin to our study group where spastic quadriplegic cerebral palsy showed statistically significant association with feeding difficulty.²⁰ However the nutritional status of children with quadriplegic CP was better when compared to diplegics and children with choreoathetoid cerebral palsy in our study, possibly due to the greater energy expenditure in children with choreoathetoid cerebral palsy and lesser mobility in quadriplegic children. Pseudo bulbar paralysis a common accompaniment of quadriplegic CP could be the cause of feeding problems in them. Every effort should be made to improve the oral-motor skills of these children.

Since feeding problems were found to be significantly associated with stunting, it is important to screen children with cerebral palsy for dysphagia, chewing problems, spilling during feeding, aspiration, coughing and vomiting during meals and difficulties specific to self feeding, cup or spoon feeding so that timely remedial measures can be implemented. Clinical signs of nutritional deficiencies were evident in the study group though the number who showed these signs was less than expected compared to their overall nutritional status. This could probably have been due to the fact that the 21.3 % were on vitamin supplements.

LIMITATIONS OF THE STUDY

The limitations of this study include the small sample size, the fact that the nutrition of the mother was not assessed and the fact that there was no control population.

As the sample was a group who attended a hospital, these children may be different from the general population of children with cerebral palsy as they may include those children who are prone to recurrent respiratory tract infection or those who are chronically underfed due to the large part of their time being spent in the hospital.

CONCLUSIONS

The prevalence of acute and chronic malnutrition among children with cerebral palsy is still substantial in our country despite the better nutritional status of similar children in other countries and is a reflection of uneven resources in the care of children with cerebral palsy. There is scarcity of data about children with cerebral palsy who are at risk of developing malnutrition. The result of the present study shows that majority of the children with cerebral palsy were suffering from wasting, stunting and PEM. Almost all children had various feeding problems. The type of cerebral palsy had influence on the feeding problems. There was statistically significant association between feeding problems and stunting.

END NOTE

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REFERENCES

1. Motil KJ. Enteral nutrition in the neurologically impaired child. In: Baker SB, Baker RD Jr, Davis A, eds. Pediatric Enteral Nutrition. New York: Chapman & Hall, 1994:217-37.
2. Thomas AG, Akobeng AK. Technical aspects of feeding the disabled child. *Curr Opin Clin Nutr Metab Care* 2000; 3:221-5.
3. Samson-Fang L, Fung E, Stallings VA, Conaway M, Worley G, Rosenbaum P, et al. Relationship of nutritional status to health and societal participation in children with cerebral palsy. *J Pediatr*. 2002 Nov; 141(5):637-43.

4. Soyulu OB, Unalp A, Uran N, Dizdarer G, Ozgonul FO, Conku A, et al. Effect of nutritional support in children with spastic quadriplegia. *Pediatr Neurol*. 2008 Nov; 39(5):330-4.
5. Marchand. Nutrition in neurologically impaired children. *Paediatr Child Health*. 2009; 14(6):395-401.
6. Rogers B. Feeding method and health outcomes of children with cerebral palsy. *J Pediatr*. 2004 Aug; 145(2 Suppl):S28-32.
7. Sleigh G, Brocklehurst P. Gastrostomy feeding in cerebral palsy: a systematic review. *Arch Dis Child*. 2004 Jun; 89(6):534-9.
8. Samson-Fang L, Butler C, O'Donnell M. Effects of gastrostomy feeding in children with cerebral palsy: an AACPD evidence report. *Dev Med Child Neurol* 2003; 45:415-26.
9. Sullivan PB, Juszczak E, Bachlet AME, Lambert B, Vernon-Roberts A, Grant HW, et al. Gastrostomy tube feeding in children with cerebral palsy: a prospective, longitudinal study. *Dev Med Child Neurol*. 2005 Feb; 47(2):77-85.
10. Stallings VA, Charney EB, Davies JC, Cronk CE. Nutritional status and growth of children with diplegic or hemiplegic cerebral palsy. *Dev Med Child Neurol*. 1993 Nov; 35(11):997-1006.
11. Krick J, Murphy-Miller P, Zeger S, Wright E. Pattern of growth in children with cerebral palsy. *J Am Diet Assoc*. 1996 Jul; 96(7):680-5.
12. Dahl M, Thommessen M, Rasmussen M, Selberg T. Feeding and nutritional characteristics in children with moderate or severe cerebral palsy. *Acta Paediatr*. 1996 Jun; 85(6):697-701.
13. Stallings VA, Charney EB, Davies JC, et al. Nutrition-related growth failure of children with quadriplegic cerebral palsy. *Dev Med Child Neurol* 1993; 35:126-38.
14. Samson-Fang LJ, Stevenson RD. Identification of malnutrition in children with cerebral palsy: poor performance of weight-for-height centiles. *Dev Med Child Neurol*. 2000 Mar; 42(3):162-8.
15. Stallings VA, Cronk CE, Zemel BS, et al. Body composition in children with spastic quadriplegic cerebral palsy. *J Pediatr* 1995; 126:833-9.
16. Reilly S, Skuse D. Characteristics and management of feeding problems of young children with cerebral palsy. *Dev Med Child Neurol* 1992; 34:379-88.
17. Stallings VA, Zemel BS, Davies JC, Cronk CE, Charney EB. Energy expenditure of children and adolescents with severe disabilities: a cerebral palsy model. *Am J Clin Nutr*. 1996 Oct; 64(4):627-34.
18. Hung JW, Hsu TJm, Wu PC, Leong CP. Risk Factors of Undernutrition in Children with Spastic Cerebral Palsy *Chang Gung Med J* 2003;26:425-32.
19. Varghese R, Jayakumar C, Jayaprakash R, Ajith Krishnan A.S, Leela kumary P. Malnutrition and obesity on a paediatric ward of tertiary teaching hospital in Kerala, India. *AMJ* 2009; 1, 7, 29-32.
20. Gangil A, Patwari AK, Aneja S, Ahuja B, Anand VK. Feeding problems in children with cerebral palsy. *Indian Paediatr* 2001;38(8):839-46