

## Original Article

## Feeding difficulties in children with cerebral palsy

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**Background** Children with cerebral palsy (CP) often have feeding difficulties due to their disability. This results in inadequate calorie intake which finally leads to malnutrition. Several studies found that 30-90% of children with CP have feeding difficulties associated with malnutrition. There has been no sufficient published data about this problem in Indonesia.

**Objective** To determine the prevalence of feeding difficulties and malnutrition in children with CP.

**Methods** A cross-sectional study was done from January to September 2005 in the pediatric outpatient clinic of Dr. Cipto Mangunkusumo Hospital (CMH). Children with CP underwent nutritional and feeding difficulties assessment. Nutritional status was determined by the ratio of body weight to body height standardized to CDC-NCHS 2000 growth curve and were classified based on Waterlow. Calorie intake was evaluated by dietary analysis and defined as adequate if it reached 13.9 kcal/cm BH  $\pm$  10%. Feeding difficulties assessment included history taking, physical examination and observation of feeding skill in the outpatient clinic.

**Results** Fifty-five children with CP were included in this study, most of them were spastic type, mainly spastic diplegic and spastic quadriplegic cerebral palsy (SQCP). Malnutrition was found in 76% subjects, most were SQCP. Feeding difficulties were found in 76% subjects, half of them were SQCP, 38% with spastic diplegic. Thirty-eight percents of the parents whose children had feeding difficulties was not aware of these problems in their children. Parallel with data above, 78% subjects received inadequate calorie intake.

**Conclusions** The prevalence of undernourished and severe malnutrition in children with CP is 66% and 11% respectively. Malnutrition in CP patients tends to be related with inadequate calorie intake due to feeding difficulties that is found in 78% subjects especially those with SQCP [Paediatr Indones 2008;48:224-9].

**Keywords:** cerebral palsy, feeding difficulty, calorie intake

Nutrition is an important basic requirement for growth and development of children. If a child can eat well, nutrition requirements can be met. Children with special health problem like cerebral palsy (CP) often have feeding difficulties influencing their growth.<sup>1,2</sup> Nutritional problems and feeding dysfunction in these children are often not recognized by their parents.

The prevalence of feeding difficulties in CP children varies between 30-90%.<sup>3,4</sup> The main etiology of feeding difficulties in CP children is oromotor dysfunction (OMD), leading to inadequate chewing and swallowing, requiring longer feeding session, and finally causing inadequate calorie intake.<sup>5</sup> Other factors which can influence calorie intake in CP children are postural abnormality, communication disorder, and emotional stress of their parents. Other associated disorders of CP such as mental retardation, hearing or visual impairment, seizures, also contribute to the severity of feeding difficulties. All of these impairments

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give negative impact to calorie intake and malnutrition in majority of CP children.<sup>2,5</sup>

Several studies in developed and developing countries have shown that majority of children with CP suffered from malnutrition.<sup>6,7</sup> Unfortunately, there has been no enough data regarding this issue in Indonesia. Therefore, we did a study to evaluate feeding difficulty profile and nutritional status of children with CP in Cipto Mangunkusumo Hospital (CMH), Jakarta. The aim of our study was to determine the prevalence of malnutrition and feeding difficulties in children with CP, to determine calorie intake, and to find out types of feeding difficulties in these patients.

## Methods

This was a cross-sectional descriptive study to investigate the nutritional status and feeding difficulties in children with CP. Patients with other associated disorders of CP such as mental retardation, hearing or visual impairment and seizures were not included in this study. This study was conducted at the Child Health Department and Medical Rehabilitation Department from January to September 2005. The accessible population was all CP children aged 1-10 years old who visited the outpatient clinics for ambulatory care. Patients with tube feeding, or who were seriously ill that it could influence nutritional status such as those suffered from diarrhea, meningitis, malignancy, were excluded from the study. Variables studied were calorie intake, nutritional status and type of feeding difficulties.

Diagnosis of CP was established by Pediatric Neurology Division based on CP classification as: spastic (quadriplegic, diplegic, hemiplegic, paraplegic), hypotonic, dyskinetic, and mixed CP.<sup>8</sup> Each patient

was weighed by single standard weighing scale with 0.1 kg accuracy. The ratio of actual body weight to ideal body weight for a given height was determined and then plotted to CDC-NCHS 2000 growth curve. Spastic quadriplegics CP (SQCP) patients were also compared to CP growth curve of Krick. Determination of nutritional status was based on the Waterlow classification (body weight/body height or BW/BH) < 70% was considered as severe malnutrition, 70-90% undernourished, 90-110% well-nourished, 110-120% overweight, > 120% obesity.<sup>10</sup> Calorie intake was evaluated by dietary analysis using one month recall method. Calorie intake was adequate if it reached 13.9 kcal/cm BH  $\pm$  10%.<sup>11</sup> Assessment of feeding difficulties was done by single examiner (LKW), including history taking, physical examination, and observation of feeding skill. Data were analysed using SPSS version 12 for Windows®.

## Results

Fifty-five children with CP were included in this study, aged from 13 months to 9 years old, with the mean of age of 3 years and 4 months old. There were 24 girls and 31 boys. About 96% of subjects were of spastic CP type, and the majority were diplegic and SQCP.

**Table 1** shows that about 66% of subjects were undernourished. Six of 55 subjects (11%) were severely malnourished and all of them suffered from SQCP type. However, based on the Krick curve, only 9 of 22 SQCP subjects were undernourished and none of them was severely malnourished (**Table 2**).

Almost all of the patients had SQCP (90%); 15 of 23 (65%) spastic diplegic patients received inadequate calorie intake. All severely malnourished and the majority (86%) of undernourished subjects had inadequate calorie intake. There was one undernour-

**Table 1.** Nutritional status based on anthropometric measurement BW/BH (CDC NCHS 2000 curve)

CP types	Nutritional status				Number
	Severe malnutrition	Under-nourished	Well-nourished	Obesity	
Spastic diplegic	0	13	10	0	23
Spastic quadriplegic	6	16	0	0	22
Spastic hemiplegic	0	5	1	0	6
Spastic paraplegic	0	0	1	1	2
Hypotonic	0	2	0	0	2
Total	6	36	12	1	55

**Table 2.** Comparison of nutritional status

Nutritional status	CDC-NCHS 2000 curve	Krick curve
Severe malnutrition	6	0
Undernourished	16	9
Well-nourished	0	12
Obesity	0	1

ished subject who had excessive calorie intake, that was one with intractable epilepsy receiving ketogenic diet (Table 3).

Our study found 42 subjects (76%) had feeding difficulties. Fifty percents of them were SQCP, 38% spastic diplegic, 3 subjects of spastic hemiplegic and 1 subject of each type of paraplegic and hypotonic. Thirty-eight percents of the parents' had not been aware of the feeding difficulties. The most frequent complaints of feeding difficulties were swallowing difficulty (57%), longer time of feeding (38%), frequent choking/coughing (33%), difficulty in drinking (31%) and frequent vomiting (24%).

Oromotor dysfunction (OMD) was the most frequent causative factor for feeding difficulties in our patients (56%). Other common etiology of feeding difficulties was bad postural control. Almost all subjects with severe malnutrition had OMD and bad postural control (Table 3). Types of oromotor dysfunction are listed in Table 4.

## Discussion

This study had several limitations because this was a cross-sectional and descriptive study, hence the results depended on the actual subjects' condition. The limited number of subjects also resulted in limited

types of CP included. It would be better if all types of CP were included.

Spastic CP was the most common type of CP, similar to a study by Sharma *et al* in India (77.9% of 480 CP patients). In this study we found 42% of subjects with SQCP, similar to that of Sullivan *et al* who found this type in 71% patient. Patients with this type of CP have more severe impairments than those with other types and often suffered from postural control imbalance as well as oral dysfunction.

The prevalence of malnutrition in our series (76%) was similar to the report of Gangil *et al*<sup>5</sup> in India (86%; including 67% undernourished and 19% severely malnourished) using BW for age as the standard. Subjects of Gangil *et al*<sup>5</sup> study included 75% SQCP patients. The prevalence of malnutrition was higher than that in developed countries as reported by Sullivan *et al*<sup>13</sup> in United Kingdom (38%), Ozturk *et al* in Turkey (34.9%), and Hung *et al*<sup>15</sup> in Taiwan

**Table 4.** Frequency and types of oromotor dysfunction

Types	Frequency	%
1. Sucking & swallowing difficulties	22	19
2. Drooling	17	15
3. Poor lips closure	16	14
4. Perioral hyposensitiveness / hypersensitiveness	11	9
5. Tongue thrust	8	7
6. Limited tongue movement	7	6
7. Choking	6	5
8. Persistent bite reflex	6	5
9. Jaw instability	6	5
10. Poor respiratory coordination	5	4
11. Poor gag reflex	5	4
12. Lips retraction	4	3
13. Primitve chewing reflex	4	3
Number	117	100

Note: each subject can have >1 disorder

**Table 3.** Calorie intake and feeding difficulties of CP children

CP types	Calorie intake			n	Feeding difficulties*	
	Inadequate	Adequate	Excessive		OMD	Bad postural control
Spastic diplegic	15	7	1	23	20	15
Spastic quadriplegic	20	2	0	22	10	10
Spastic hemiplegic	6	0	0	6	1	0
Spastic paraplegic	0	2	0	2	0	1
Hypotonic	2	0	0	2	0	1
Nutritional status						
Severe malnutrition	6	0	0	6	5	5
Undernourished	31	4	1	36	25	17
Well-nourished	6	6	0	12	1	5
Obesity	0	1	0	1	0	0
Total	43	11	1	55	31	27

♦ Each subject can have >1 disorder; n = number of patient.

(41.3%). This difference might be due to several factors. Firstly, there were different methods used to assess nutritional status. Sullivan *et al*<sup>13</sup> and Ozturk *et al*<sup>14</sup> used BW/age below -2 standard deviation of z-scores. Secondly, subjects in those studies were patients with good treatment and compliance, which was different from our subjects who received delayed treatment and had bad compliance resulting in non optimal medical and rehabilitation treatment.

Hung *et al*<sup>15</sup> in Taiwan used similar method in nutritional assessment with our study. If we compared our results with that study in which SQCP percentage was similar with ours, we found that the numbers of SCQP and spastic diplegic subjects with malnutrition were about two times higher in our study. The percentage of patients with malnutrition in our study was higher (50%) than that was found by Gangil *et al*<sup>5</sup> in India (16%). These showed that our patients in CMH had worse nutritional status than those in India and Taiwan.

We also used the Krick<sup>9</sup> curve for SQCP subjects to determine their nutritional status. Plotting to this curve resulted in better nutritional status than using CDC-NCHS 2000 curve. It could be understood because the 50th percentile of the Krick<sup>9</sup> curve is similar with the 10th percentile of CDC-NCHS 2000 curve. This disparity should be weighed against clinical assessment, which was not done in our study, to look for the precise nutritional status. Obesity can occur in CP because of immobility and excessive calorie intake similar. There was one child with spastic paraplegic who can eat well by himself. Similar results also found by Gangil *et al*<sup>5</sup> and Hung *et al*.<sup>15</sup>

Malnutrition in CP is related to inadequate calorie intake. Stallings *et al*<sup>16</sup> and Sullivan *et al*<sup>17</sup> reported that although the energy requirement of CP patients was lower than that of normal children, they also have lower calorie intake. Our study found that about 78% of subjects did not receive adequate calorie intake, which was similar to that reported by Gangil *et al*<sup>5</sup> and Sullivan *et al*<sup>17</sup> (80%). Our study also found that some malnourished subjects who actually received adequate calorie intake. This should lead us to look for other contributing factors for malnutrition such as gastroesophageal reflux (GER), or chronic diseases, which were not evaluated in our study. Inadequate calorie intake in CP children can

be due to the presence of feeding difficulties including OMD, bad postural control or maturational delay in feeding skill development.<sup>18</sup> We found that almost all subjects with inadequate calorie intake also had feeding difficulties. Other factors might also contribute because there were nine of 13 subjects without feeding difficulties who were undernourished. Other possible contributing factors were visual or hearing impairments, gastroesophageal reflux, constipation, and stressful feeding sessions.<sup>4</sup>

Malnutrition in CP patients is related to feeding difficulties.<sup>3</sup> Moreover, feeding difficulties are also related to lower life expectancy as well as higher morbidity and mortality rate. If feeding difficulties persist, it can increase mortality rate up to six folds.<sup>19</sup> There was no agreement about feeding difficulties definition in the literature, resulting in difficulty in making comparison among studies.<sup>17</sup> Our study used definition of feeding difficulties by Palmer *et al*<sup>2</sup> that feeding difficulties are the inability or refusal to eat certain foods because of neuromotor dysfunction, obstructive lesions, or psychological factors interfering with eating or a combination of two or more of these.

Our study found that 76% subjects had feeding difficulties and most of them had OMD or bad postural control. It was higher than that reported by Fung *et al*<sup>3</sup> in US and Canada (58%), this may be due to higher percentage of SQCP subjects in our study and different study methods. They identified feeding difficulties based on questionnaires while we did observational assessment. The percentage of subjects with OMD in our study was lower than that of Reilly *et al*<sup>4</sup> (91% OMD) because they used video recording method in their assessment.

Feeding difficulties are related to the severity of CP. Spastic quadriplegic CP patients classified as severe CP, commonly have feeding difficulties.<sup>3</sup> Fung *et al*<sup>3</sup> reported that malnutrition was significantly correlated with feeding difficulties and patients using tube feeding had better nutritional status. We also found similar results that 96% SQCP and 70% spastic diplegic patients had feeding difficulties and most of them also malnourished. This was higher than that reported by Gangil *et al*<sup>5</sup> (81.3% and 20%).

Complaints of feeding difficulties in CP patients are important. The absence of these complaints from the parents does not mean that it does not exist. We found that 38% of parents did not aware of their



children's feeding difficulties. Gangil *et al*<sup>5</sup> also found these phenomena in 10% of their subjects.

We found that one third subjects complained frequent coughing/choking or vomiting during eating similar with study of Gangil *et al*.<sup>5</sup> These complain were signs of swallowing disorder especially in pharyngeal phase and related to aspiration to laryngeal tract.<sup>20</sup> Aspiration in CP can occur in pre pharyngeal phase due to poor tongue control, or in pharyngeal phase due to delayed pharyngeal movement and laryngeal closure, or in post pharyngeal phase due to residual food in pharyngeal cavity. If this complains exist we must consider about silent aspiration and parents' of patients should underwent videofluoroscopic study because it is difficult to diagnose based on clinical examination only.<sup>20</sup> Beside silent aspiration, we must also consider other illness such as GER because it was found in 70-90% CP<sup>20</sup> and half of them also had respiratory tract aspiration.<sup>21</sup>

In this study, oromotor dysfunction was the most frequent type of feeding difficulties, which was similar with the result of Gangil *et al*<sup>5</sup> and Reilly *et al*<sup>18</sup> studies. Gangil<sup>5</sup> reported that around 70% of CP patients had poor feeding skill regarding the presence of OMD and it was related to malnutrition. We did not calculate feeding score, but we found similar tendency, that 30 of 31 subjects with OMD were also malnourished and had inadequate calorie intake. In this study, sucking/swallowing disorder, drooling, and poor lips closure were the most frequent OMD.<sup>22</sup> Ability of sucking and swallowing needs complete coordination between sensory stimuli and normal muscle tones which were absence in CP.<sup>22</sup>

Drooling is normal condition until 2 years of age. In children with CP, drooling can persist in 10-38%. These children usually have worse functional skill, more severe OMD and swallowing disorder.<sup>23,24</sup> We found 30% of our subjects with drooling and most of them were SQCP subjects, similar with that was reported by Tahmassebi *et al*.<sup>24</sup>

Good postural control is needed to achieve effective feeding process. Children with CP often have bad postural control resulting in weak head and trunk control and inability to maintain body position.<sup>2,25</sup> Neck hyperextension results in tongue retraction, depressed mandible and swallowing disorder, and the increase tendency of aspiration. Poor postural control disturbing balance is commonly found in SQCP pa-

tients, but in spastic diplegic, the disturbance is usually mild and does not affect the patients' balance.<sup>26</sup> We found that majority of SQCP subjects had bad postural control and all of them received inadequate calorie intake. Poor postural control was found less in spastic diplegic patients (10 of 23) and only five of them had inadequate ieintake.

We concluded that prevalence of undernutrition in CP children in CMH was 66% and 11% were severely malnourished. Severe malnutrition was especially found in SQCP patients. About 78% of our CP patients received inadequate calorie intake, especially the SQCP patients, and 76% had feeding difficulties. The most frequent feeding difficulties were OMD and poor postural control. We suggested that nutritional and feeding difficulties assessment should be done in every patient with CP, especially those with severe CP, drooling, or poor postural control, although they did not complain of feeding difficulties. We also should consider about silent aspiration and GER in those children. Prospective studies to determine the role of nutritional and rehabilitation treatment in CP patients are recommended.

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