

**Nutritional Status of Children with Cerebral Palsy  
in Cerebral Palsy Clinic, Yangon Children's Hospital**

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There has been an increased awareness that significant proportion of children with special needs including cerebral palsy (CP) is undernourished. It can predispose to further morbidities imposing more suffering to the affected child and the family. This study aimed to determine the proportion of malnutrition in children with CP and to find out the association between the clinical factors and malnutrition. It was a cross-sectional descriptive study conducted at CP Clinic, Yangon Children's Hospital (YCH) from May 2010 to June 2011. Children aged from 1 month to 12 years with all types of CP were included in the study. Data were collected by face-to-face interview with caretakers using the pretested structured questionnaire, measuring weight and height/length and examination to determine type of CP and level of gross motor function of the children. Nutritional status was classified according to Waterlow classification. Among 173 children with CP, 78.6% had undernutrition, 53.8% were wasted and 52% were stunted. Older age ( $p=0.002$ ) and feeding solid foods ( $p<0.001$ ) were significantly associated with undernutrition. In children  $>18$  months, those who depended totally on caregivers for feeding ( $p=0.03$ ) and spastic quadriplegic CP compared to other spastic types ( $p=0.03$ ) were significantly associated with undernutrition. Malnutrition is quite prevalent in children with CP in YCH and nutritional support should be an integral part of the management of these children.

## INTRODUCTION

Cerebral palsy (CP) is a well-known neuro-developmental condition beginning in early childhood and persisting throughout one's life span.<sup>1</sup> The average incidence is approximately 2-2.5 per 1000 live births.<sup>2</sup> This term describes permanent disorder of the movement and posture causing activity limitation due to non-progressive disturbances in the developing brain.<sup>3</sup> Throughout the world, parents and doctors have focused on growth determinants of healthy children. In recent years, there has been an increased awareness that significant proportion of children with special needs including CP is undernourished.<sup>4</sup>

This condition may have been once considered as part of the disease, but the importance of nutrition in this population now better recognized.<sup>5</sup>

The incidence of undernutrition and poor growth, which is up to 86% in literature, is related not only with severe forms but also with mild forms of CP.<sup>6, 7</sup> This is a very important issue and needs to be addressed. If left untreated, severe nutritional problems may be exacerbated. Therefore, identification of the factors associated with undernutrition is important for the early detection and treatment and for the prevention of late complications in the children's behavior, health, or growth. In Yangon Children's Hospital (YCH), CP clinic was established

in 2006 and many children with CP register there and are having care. This study aimed to determine the proportion of under-nutrition in children with cerebral palsy in CP clinic, to identify the medical problems, feeding characteristics, type of CP, gross motor function and communicating ability in children with CP and to find out the association between different clinical factors and undernutrition in children with CP. Determining the above factors may lead to start timely nutritional rehabilitation, which can significantly improve their nutritional status and quality of life.

## MATERIALS AND METHODS

It was a cross-sectional, descriptive study conducted at CP Clinic, YCH from May 2010 to June 2011. Children aged from 1 month to 12 years with all types of CP were included in the study. Patients with any known chronic illness (i.e., cardiac, renal, gastrointestinal, endocrinological or syndromal), any congenital malformation that would independently affect food intake like cleft lip and/or palate and patients who have routine ingestion of any medication (i.e., steroids) which is known to affect growth were excluded from the study. Consecutive sampling method was used.

Data were collected by face-to-face interview with caretakers using pretested structured questionnaire, measurement of body weight and height/length and examination of type of CP and level of gross motor function of the children. Severity of motor impairment in the children with cerebral palsy was graded using the Gross Motor Function Classification System (GMFCS). Five-point ordinal scale was described in levels (I mild to V severe).

Each child's weight was measured to the nearest 0.1 kg using basinet or standing scales as appropriate for age. Children who could not stand and whose weight had exceeded the range on the basinet were weighed in the arms of the mother. The difference between the combined weight of

mother and child and that of mother alone was recorded as the child's weight.

Height was measured using the stadiometer for patients who were able to stand flat-footed and straight. The recumbent length was measured for subjects who were unable to stand erect by using somatometer. All measurements were recorded to the nearest 0.1 cm. All measurements were performed by the trained investigator, using the same instrument throughout the study. Nutritional status was classified according to Waterlow classification.<sup>8</sup> As for acute malnutrition, weight for height/length 80-90% of median was considered as mild malnutrition, 70-80% as moderate malnutrition and <70% as severe malnutrition. For chronic malnutrition, height for age 90-95%, 85-90% and 80-85% was considered as mild, moderated and severe malnutrition. Weight for height <80% was termed wasted and height for age <90% was termed stunted.

### *Statistical analysis*

The data were subjected to statistical analysis using the SPSS 16.0 software package. The data were analyzed to determine the proportion of undernutrition among cerebral palsy and the influences of the various factors. The univariate analysis was performed to identify which variables were predictors of undernutrition. T-test and Chi-square tests were used to compare means and proportions, respectively.

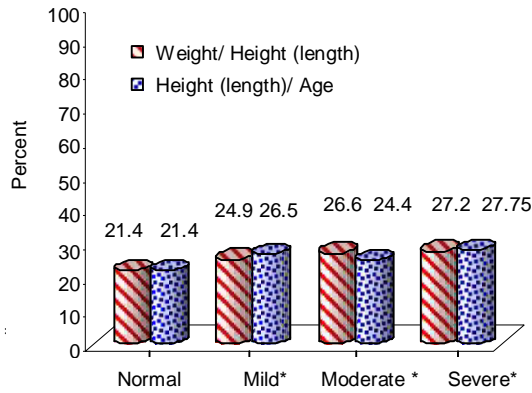
### *Ethical consideration*

This study was approved by the Ethical Review Committee of Department of Medical Research (Lower Myanmar). Written informed consent was obtained from the parents or caregivers of the children before the interview.

## RESULTS

Our study included 173 children with cerebral palsy with median age of 18 months (range; from 2 to 144 months). Among them, 59.5% (103 of 173) were boys and 40.5% (70 of 173) were girls.

Figure 1 illustrates the results of the anthropometric measures of nutritional status of children with cerebral palsy. According to Waterlow classification, 78.6% (136 out of 173) had malnutrition. Among the children, 53.8% were wasted and 52% were stunted.



\*= Malnutrition

Fig. 1. Classification of anthropometric measures for nutritional status of children with cerebral palsy (Waterlow classification)

As medical problems, 20.2% had seizures, 24.9% had recurrent pneumonia, 46.8% had drooling, 54.9% had constipation and 29.5% had sleep problem. One or more feeding problems were seen in 84.4% of children with choking (26.0%) as the commonest type followed by tongue thrust (19.1%), chewing problem (19.1%), cry/extensor dystonia (10.4%), vomiting/regurgitation (6.9%), swallowing problem (3.5%) and jaw contracture/dystonia (1.7%).

In this study, the commonest type of CP was spastic quadriplegic CP which was 50.9% (88 out of 173) of all type of CP. Spastic hemiplegic, spastic diplegic, spastic monoplegic, dystonic, hypotonic and mixed type of CP were also seen in 13.3%, 2.9%, 1.7%, 17.3%, 13.3% and 0.6%, respectively. Most of the children had Gross Motor Function V(34.9%) followed by GMF IV (26.7%), GMF III(26.7%), GMF II(10.5%) and GMF I(1.2%).

When comparing the groups of children with and without malnutrition, mean age of children with malnutrition was significantly older than that without malnutrition,

28.24±23.43 months in malnutrition group and 17.38±16.10 in well nourished group (p=0.002) on univariate analysis. There was no association between malnutrition and gender or medical problems (Table 1).

Table 1. Comparisons of the bio-demographic characteristics and medical problems of children with CP with and without malnutrition

	Malnutrition		p
	Yes (n=136)	No (n=37)	
	No. (%)	No. (%)	
<i>Gender</i>			
Male	78(75.7)	25(24.3)	0.26
Female	58(82.9)	12(17.1)	
<i>Medical problems</i>			
Seizures	28(80.0)	7(20.0)	0.82
Recurrent pneumonia	35(81.4)	8(18.6)	0.61
Drooling	66(81.5)	15(18.5)	0.39
Constipation	76(80.0)	19(20.0)	0.62
Sleep problem	36(70.0)	15(29.0)	0.09

Any feeding problem, duration per meal or frequency of meal per day did not differ significantly between children with and without malnutrition. However, as regard for food texture, malnutrition was significantly associated with feeding solid food (p<0.001) (Table 2).

Table 2. Comparisons of feeding characteristics of children with cerebral palsy with and without malnutrition

	Malnutrition		p
	Yes (n=136)	No (n=37)	
	No. (%)	No. (%)	
<i>Feeding problems</i>			
Cry/extensor dystonia	11(61.1)	7(38.9)	0.06
Jaw contracture/dystonia	3(100.0)	-	0.36
Tongue thrust	26(78.8)	7(21.2)	0.98
Chewing problem	27(81.8)	6(18.2)	0.62
Swallowing problem	5(83.3)	1(16.7)	0.77
Choking	35(77.8)	10(22.2)	0.87
Vomiting/regurgitation	8(66.7)	4(33.3)	0.29
<i>Feeding habits</i>			
<i>Food texture</i>			
Liquid or semisolid	13(50.0)	13(50.0)	<0.001*
Solid	123(83.7)	24(16.3)	
<i>Duration per meal (min)</i>			
<20	73(75.3)	24(24.7)	0.18
>20	62(83.8)	12(16.2)	
Frequency of meal per day (times) (Mean±SD)	2.78±1.17	3±1.86	0.38

\* indicates significant difference between two groups

In children older than 18 months, those who depended totally on caregivers for feeding were significantly associated with under-nutrition ( $p=0.03$ ). Children with poor gross motor function (GMF IV and V) had more malnutrition than less severe group (GMF I, II & III) but not statistically significant. Communication ability was not associated with malnutrition (Table 3).

Table 3. Comparisons of functional status in children above 18 months old with and without malnutrition

	Malnutrition		p
	Yes (n=136) No. (%)	No (n=37) No. (%)	
<i>Dependence on feeding</i>			0.03*
Totally	52(92.9%)	4(7.1%)	
Partially or independent	23(76.7%)	7(23.3%)	
<i>Communicating ability</i>			0.69
None or voicing or word	65(86.7)	10(13.3)	
Sentence	10(90.9)	1(9.1)	
<i>Gross motor function</i>			0.065
GMF I, II & III	26(78.8)	7(21.2)	
GMF IV & V	49(92.5)	4(7.50)	

\* indicates significant difference between two groups

Malnutrition was significantly associated with spastic quadriplegic type of CP compared to other spastic types (diplegic, hemiplegic or monoplegic) in children older than 18 months ( $p=0.03$ ). However, there was no statistically significant difference between spastic quadriplegic or other spastic type and non spastic types (dystonic, hypotonic and mixed).

## DISCUSSION

This study was conducted in CP clinic in Yangon Children's Hospital. Although it might not representative of the whole CP population in Myanmar, it can be considered representative of children with CP in a tertiary care center in this country.

In the current study, anthropometric assessment showed higher proportion of malnutrition 78.6% in children with CP, which was comparable to the report from Indonesia (76%)<sup>9</sup> and India (86%).<sup>7</sup> The prevalence of malnutrition was higher than that of studies in developed countries such

as Egypt (15%),<sup>10</sup> United Kingdom (38%),<sup>11</sup> Greece (38%),<sup>12</sup> Turkey (34.9%)<sup>13</sup> and Taiwan (41.3%).<sup>4</sup> The difference might be due to the use of different anthropometric classification in these studies because there are no universally accepted diagnostic criteria to measure the nutritional status of children with CP. We used weight-for-height/length to classify malnutrition in this study because it may be a more reliable indicator of current nutritional status, and this measurement is relatively independent of age and ethnic group.<sup>14</sup> The difference in taking good treatment and compliance, high degree of support for feeding problems and adequate food provision between developed and developing countries may also affect the prevalence of malnutrition in this chronic disease.<sup>11</sup> Some studies found that overweight was also a problem as 5.4% to 18.2% in children with CP.<sup>12, 15, 16</sup> Contrast to this, there was no overweight children in this study reflecting that undernutrition was more important problem in our setting.

In our study, about 52% of children with cerebral palsy were stunted which is slightly lower than 60% of a study from UK<sup>17</sup> but much higher than 9.2% in a study from Nigeria.<sup>18</sup> Stunting is an indicator of chronic malnutrition. According to literatures, stunting has been noted to worsen with advancing age in cerebral palsy.<sup>19, 20</sup>

Comparable to other studies,<sup>21, 22</sup> older children had higher risk of malnutrition ( $p=0.002$ ). However, it is contrast to one study, which found that children in the youngest age group were most at risk for poor nutritional status and delayed growth.<sup>14</sup> In our country, the prevalence of malnutrition increased with age even in normal children.<sup>23</sup> It may be due to the fact that the practice of reducing the frequency of breastfeeding and inadequacy of complementary feeds either in quantity or quality in the second year of life adversely affected nutritional status of children.

Studies in Turkey, Taiwan and Mexico indicated that CP girls are at high risk for

underweight and argued that there was a gender discrimination against disabled girls in nutrition.<sup>4, 16, 21</sup> However, there was no association between gender and malnutrition in this study, which may also reflect the non-discrimination between male and female offspring in our sociocultural environment.

Screenings for feeding problem is important because it impairs the child's ability to safely consume the necessary nutrients and to consider the safe feeding route. Although one or more feeding problem was seen in 84.4% of children in our study, no association was found between any of the feeding problems and malnutrition, which is similar to other studies.<sup>4, 24</sup>

We identified feeding problem based on questionnaires, therefore, absence of these complaints from the parents does not mean that it does not exist.<sup>9</sup> In this study, undernutrition was significantly associated with children mainly having solid food ( $p < 0.001$ ) contrast to finding of a study which showed children who were fed with liquid or soft food tended to be undernourished.<sup>4</sup> Children with CP should be offered food that they can eat with least frustration.<sup>7</sup> Solid food is more difficult to eat by CP and it may not provide adequate nutritional requirement for the child. In our study, we cannot measure the caloric intake of the children. However, duration and frequency of feeding were not associated with undernutrition, which is in concordance with Hung *et al.* study.<sup>4</sup> Alternative feeding routes should be considered in children with feeding difficulties who cannot have sufficient oral intake to maintain adequate nutritional status.<sup>25</sup>

We analyzed the functional ability of CP children older than 18 months because most normal children get around easier and have good functional ability at this age. Low functioning CP children (GMF IV and V) tended to be malnourished more than those with mild to moderate impairment but this is not statistically significant. Similar to other studies, we also found that children with

severe spastic type (quadriplegic CP) had higher risk to be malnourished compared to other spastic types in older than 18 months old group ( $p = 0.03$ ).<sup>4</sup> This association may be due to the fact that children with quadriplegic limb involvement may have severe feeding problems compared with mild impairment.

In our study, although communication ability was not found to be related with malnutrition, children who had total dependence on caregivers for their feeding was significantly associated with malnutrition ( $p = 0.03$ ). When the children are unable to assess their food, caretakers are left to be responsible for regulating their intake.<sup>25</sup> However, caregivers may not meet the caloric intake need because they cannot cope with the lengthy mealtimes and the feeding problem. There are some limitations in this study. We cannot exclude the effect of socioeconomic status of family on nutritional status of children and cannot conduct the proper dietary survey. The prevalence of malnutrition depends on the diagnostic criteria used and it should be cautioned to compare the result of this study with others.

### *Conclusion*

Malnutrition and feeding problems are quite prevalent in children with CP at YCH. It is associated with older age, feeding mainly solid food and higher dependence on caregivers for feeding. Nutritional support should be an integral part of the management of these children and nutritional intervention should be provided by a multidisciplinary team to ensure adequate growth, improve quality of life and optimize functional status.

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