Malnutrition in Children with Cerebral Palsy: An Indian Study

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Abstract
Cerebral palsy is the commonest neurological disorder of childhood associated with significant motor impairment. The children with cerebral palsy are found to have poor growth. Poor caloric intake and difficulty in feeding are common factors attributed for malnutrition in them. Children with cerebral palsy have significantly smaller weights for height, heights for age, and weights for age compared to normal children. There are few studies from developing countries assessing the nutritional status of children with cerebral palsy. Hence we conducted this study to assess anthropometrically the nutritional status of children with cerebral palsy in our institute. The study aimed to assess the nutritional status of children with cerebral palsy as per WHO classification.
The prospective clinical observational study included 84 children of cerebral palsy attending outpatient and inpatient department of tertiary care institute in Mumbai.
Anthropometric assessment for underweight, wasting and stunting was calculated based on age, weight and height measurements. Underweight (W/A) was commonest malnutrition seen in 56(66.7%) followed by stunting (H/A) in 44(52.4%). No child was overweight. Wasting (W/H) was present in 18(49.9%) of under-five children. Severe stunting was present in 26(31.0%). Dietary calorie deficiency was present in 76(90.5%) and 56(66.7%) required feeding assistance. Malnutrition was common in children with cerebral palsy. Adequate dietary calorie supplementation and more judicious clinical follow up for early detection of malnutrition is required especially for children dependent on caretaker for feeding.
Keywords: *Cerebral palsy, malnutrition, calorie deficit, feeding assistance.*

Introduction

Cerebral palsy (CP) is a common childhood motor disorder affecting movement and posture resulting from a permanent non progressive defect or lesion of the immature brain. It is the most commonest motor disability of childhood both in developing and developed countries affecting about 3.6/1000 children. [1,2,3,4] It has been well documented in the literature that the children with CP frequently manifest with poor growth.[5,6] Studies have shown that children with CP have significantly smaller weights for height, heights for age, and weights for age compared to normal children. [7, 8] The main cause of poor growth in children with

CP has been attributed to inadequate nutritional intake resulting from feeding difficulties. [9,10].

Anthropometry is an easy and effective method to assess the nutritional status. There is limited literature available especially from the developing countries and also India regarding the nutritional status of children with cerebral palsy.[8] Nutritional status has an important role long-term morbidity in cerebral palsy. Hence, the present study was conducted with an aim to assess the nutritional status of the children with cerebral palsy from this institute.

Material and Methods

This prospective clinical study was conducted from January 2015 to October 2016 in a tertiary care reference hospital. The study was initiated following approval from the Institutional Ethics Committee. The study enrolled 84 children of age group 1 to 12 years with cerebral palsy attending medical services from pediatric outpatient and inpatient department of this hospital.

Patients history included demographic details, present complaints, past history of major medical illness and hospitalizations. Anthropometric measurement of the child included weight, height, head circumference, mid-arm circumference and knee height was recorded. Child was weighed on a digital weighing scale. In severely disabled child unable to stand independently, the caregiver held the child and two were weighed together and then caregiver alone and child weight was obtained by subtracting caregiver weight from combined weight.

Infantometer and stadiometer were used for measuring length or height as per the age. For estimating stature in patients with spasticity and contractures, Stevensons formula [Stature = (Knee length $\times 2.69$) + 24.7] was used, knee length was measured from proximal edge of patella to bottom of heel with both the knee & ankle at 90 degree flexion. Head circumference was measured by placing a flexible, non-stretchable measuring tape firmly over the most prominent region of the occiput and frontal crests and measurement is taken accurate to the nearest 0.1 cm. Mid-arm circumference was measured using flexible, non-stretchable tape on the left arm, midway between the acromion and the olecranon process. Each measurement was taken twice and mean value was used for analysis. Height for age, weight for height and weight for age were calculated and noted in the proforma.

Operational Definitions for classifying the malnutrition was based on WHO classification according to Z score for weight for height (wasting), height for age (stunting) and for weight for age (underweight).Malnutrition was based on WHO classification according to Z score, weight-for- height (W/H) (wasting), height- for- age (H/A) (stunting) and for weight- for- age (W/A) (underweight) was used. A Z score <-2 was Acute malnutrition (wasting)/underweight/Stunting, Z score between <-2 >= -3 Z score was Moderate wasting (MAM)/ Underweight/Stunting and Z score <-3 was Severe wasting (SAM)/ underweight/ stunting. Weight for height and upper midarm circumference (UMAC) was calculated only for children below five years of age. The qualitative data collected was noted in Microsoft excel sheet. The data was analyzed and results are presented in frequency and percentage table. The complete statistical analysis was performed by SPSS version 15 for windows.

Results

This study enrolled 84 children of age group 1 to 12 years with different types of cerebral palsy. In 84 cases 48(57%) were more than five years old and remaining 36(42.9%) below five years. Out of 84 cases, 56(66.7%) were male and 28(33.3%) were females and the M:F ratio was 2:1.

The spastic quadriplegic 38(45.2%) was the commonest type of cerebral palsy followed by Mixed/unclassifiable 17(20.4%), diplegic 16(19%), hemiplegic 12(14.3%) and dystonic 1(1.2%).Motor developmental delay was present in 63(75%) cases and Developmental quotient (DQ) of less than 70 % was present in 66(78.6%) cases.

Dietary deficiency of calories was seen in a significant majority of 76(90.5%) cases. Almost two third 56(66.7%) of the cases were dependent and required assistance for feeding.

Anthropometric indices as per WHO classification showed normal weight for age (W/A) in 28(33.3%), moderate underweight in 22(26.2%) and severe underweight in 34(40.5%). No patient in the study was overweight.

Height for age (H/A) evaluation was normal in 40(47.6%), moderate stunting in 18(21.4%) and severe stunting in 26(31.1%). Weight for height (W/H) was estimated in under five age group only consisting of 36 cases. Wasting was absent in 18(50%) while 8 (22.2%) and 10(27.7%) had moderate and severe wasting respectively.

Out of 36 under five children Upper midarm circumference (UMAC) was normal in 18(50%). Twelve (33.3%) had moderate malnutrition and 6(16.66%) had severe malnutrition. Out of 84 cases microcephaly was present in 63(73.8%) and 22(26.2%) had normal head circumference.

Table 1: Demographic and Clinical details of the cases

Age	<5 yrs	36(42.9%)
	>5 yrs	48(57%)
Sex	Male	56(66.7%)
	Female	28(33.3%)
Types of CP	Spastic quadriplegic	38(45.2%)
	Diplegic	16(19%)
	Hemiplegic	12(14.3%)
	Mixed/unclassifiable	17(20.4%)
	Dystonic	01(1.2%)
Developmental delay	Yes	63(75%)
	No	25(25%)
Developmental quotient	<70%	66(78.6%)
	>70%	18(21.4%)
Dietary calorie deficit	Present	76(90.5%)
	Absent	08(9.5%)
Feeding assistance required	Yes	56(66.7%)
	No	28(33.3%)

Table 2: Distribution of cases as per type of malnutrition based on WHO classification

	W/A(underweight)	H/A(Stunting)	W/H(Wasting)U5
Severe	34(40.5%)	26(31%)	10(27.7%)
Moderate	22(26.2%)	18(21.4%)	08(22.2%)
Normal	28(33.3%)	40(47.6%)	18(50 %)
Total	84(100%)	84(100%)	36(100%)

Table 3: Distribution of cases as per upper mid arm circumference and Head circumference

Upper mid arm cirumfrence (UMAC) in under five age	Severe	6(16.66%)
	Mild to Moderate	12(33.33%)
	Normal	18(50%)
Microcephaly	Present	63(73.8%)
	Absent	22(26.2%)

Discussion

The study was conducted to identify nutritional status of children with cerebral palsy based on anthropometric parameters. This study enrolled 84 children of age group 1 to 12 years with different types of cerebral palsy. In 84 cases 48(57%) were more than five years old and remaining 36(42.9%) below five years. Out of 84 cases, 56(66.7%) were male and 28(33.3%) were females and the M:F ratio was 2:1. The age and gender wise distribution of cases was similar to other studies. [10,11] The spastic quadriplegic 38(45.2%) was the commonest type of cerebral palsy followed by Mixed/unclassifiable 17(20.4%), diplegic 16(19%), hemiplegic 12(14.3%) and dystonic 1(1.2%). The distribution of cases based on type of cerebral palsy correlates with the other study findings. Motor developmental delay was present in 63(75%) cases and Developmental quotient (DQ) of less than 70% was present in 66(78.6%) cases. Vega-Sanchez assessed weight based nutritional diagnosis of children with neuromotor disabilities. Cerebral palsy cases were commonest and they were at higher risk of underweight and malnutrition. Sangermano in his study assessed malnutrition in children with neuromotor disorders. Fourty four percent children were at risk of malnutrition due to less calorie intake and feeding difficulties. [9,10]

Mustafa O in his study to assess nutritional status and growth showed that Height for Age scores and weight for height scores were significantly lower in age group of 7-16 years old with cerebral palsy. Sangermano M and few other studies showed similar dietary factors contributing to malnutrition. In our study dietary deficiency of calories was seen in a significant majority of 76(90.5%) cases. Almost two third 56(66.7%) of the cases were dependent and required assistance

for feeding. Anthropometric indices as per WHO classification showed normal weight for age (W/A) in 28(33.3%), moderate underweight in 22(26.2%) and severe underweight in 34(40.5%). No patient in the study was overweight. Height for age (H/A) evaluation was normal in 40(47.6%), moderate stunting in 18(21.4%) and severe stunting in 26 (31.1%). In an Iranian study by Neyestani et al under weight and stunting was quite prevalent in children with neuromotor disabilities especially the girls. It was also found that the food composition is more contributing factor for malnutrition than the calorie content. (10,11, 12)

Dahl et al assessed feeding difficulties and nutritional status of children with moderate to severe cerebral palsy, which detected malnutrition in 43% cases. Similar observations were reported by Mustafa O in a study conducted in turkey. Weight for height (W/H) was estimated in under five age group only consisting of 36 cases. Wasting was absent in 18(50%) while 8(22.2%) and 10(27.7%) had moderate and severe wasting respectively. (12)(Table-2)

Out of 36 under five children Upper midarm circumference (UMAC) was normal in 18(50%). Twelve (33.3%) had moderate malnutrition and 6(16.66%) had severe malnutrition. Out of 84 cases microcephaly was present in 63(73.8%) and 22(26.2%) had normal head circumference. (13,14)(Table-3)

The study indicated that malnutrition was common in children with cerebral palsy. Underweight was commonest type of malnutrition followed by stunting. Calorie deficiency and feeding difficulty intake was also significant. Hence, adequate dietary calorie supplementation and more judicious clinical follow up for early detection of malnutrition is extremely necessary especially, for children dependent on caretaker for feeding.

Acknowledgement

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