

Nutritional Status Of Children With Cerebral Palsy Presenting At A Tertiary Care Hospital

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Abstract

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Background: Cerebral palsy (CP) is the most prevalent childhood physical disability and it has a high association rate with poor nutritional status among children with CP, which is associated with increased energy expenditure, feeding difficulties, and motor impairment. Malnutrition has a negative impact on growth, immunity and on quality of life. **Objective:** To determine nutritional status of children with cerebral palsy (CP) presenting at a tertiary care hospital. **Methods:** This was a Cross-sectional study that was carried out at Department of Pediatrics, PGMI / Lady Reading Hospital, Peshawar. from November 2024 to April 2025. 158 children (aged 5-16 years) with clinically diagnosed, Weight and height/length were measured. Body mass index (BMI)-for-age z scores were calculated with WHO AnthroPlus software. Nutritional status was defined as obese ($>+2$ SD), normal (-2 to $+2$ SD), moderate malnutrition (-3 to -2 SD) and severe malnutrition (<-3 SD). The data were analyzed using SPSS version 20. The relationship of nutritional status with the demographic and clinical parameters was evaluated by chi-square test and

$p < 0.05$ was regarded as significant. **Results:** A total of 158 children were enrolled of whom 48.7% were of normal nutritional status, 22.8% were moderately malnourished, 25.3% severely malnourished and 3.2% obese. The mean BMI-for-age z-score was -1.87 ± 1.62 . Spastic quadriplegia ($p=0.001$), lower SES ($p=0.012$), and rural residence ($p=0.034$) were significantly associated with severe malnutrition. **Conclusions:** Malnutrition is very common among CP children, with almost half being in moderate to severe malnutrition. In order to enhance growth, nutritional status and long term health outcomes, routine nutritional screening, early dietary intervention and multi-disciplinary management are crucial in this vulnerable population.

Introduction

Cerebral palsy (CP) is a common neurodevelopmental disorder of childhood, caused by an abnormal development in the fetal or infant brain. It is a disease of the muscles, movement, posture, and affects the tone of the body, and the prevalence of which worldwide is around 3.4 per 1,000 live births [1].

The characteristic clinical manifestations of CP are motor dysfunction, abnormal muscle tone, poor posture, and movement disorders, which are the basis for the definition, classification and clinical management of CP [2,3].

CP children frequently have significant functional impairments in activities of daily living, such as self care, personal hygiene and feeding. Delayed development and swallowing problems are associated with recurrent infections, delayed growth and malnutrition [4]. Nutritional assessment is thus an integral part of the comprehensive management. Body mass index (BMI)-for-age, one of the available anthropometric indicators, is considered practical and reliable indicator of nutritional status in children [5].

Numerous studies in various countries have shown that malnutrition occurs at high prevalence in CP children. In a study carried out in Nigeria, the children with CP were found to be severely malnourished in 25.3%, moderately malnourished in 28.7% and well-nourished in 39.3% [6]. In a similar study, conducted in Saudi Arabia, almost half of the children with CP were identified as malnourished [7]. While the nutritional status of children was 62.8% normal, 11.6% and 17.7% were observed as moderate and severe malnutrition, respectively in Nepal [8]. Similarly, one study across Uganda found that just 36% of children with CP were of normal nutritional status, 19% were moderately malnourished and 45% were severely malnourished [9].

Feeding problems, increased energy needs and limitations in function can make children with cerebral palsy especially vulnerable to malnutrition. Early detection of nutritional deficiencies allows for early dietary intervention and multidisciplinary care, which will enhance growth, function and quality of life. However, information on the nutritional status of children with cerebral palsy in Pakistan is still scarce. Thus, the present study was designed to find the nutritional status of cerebral palsied children attending tertiary care hospital. Current diagnosis, communication and research continue to be guided by the criteria for cerebral palsy accepted internationally, which defines and classifies it [10].

OBJECTIVE:

To determine nutritional status of children with cerebral palsy (CP) presenting at a tertiary care hospital

METHODOLOGY

This was a Cross-sectional study that was carried out at Department of Pediatrics, PGMI / Lady Reading Hospital, Peshawar. from November 2024 to April 2025. Consequential sampling was used to recruit a sample of 158 children aged 5-16 years with clinically diagnosed CP, a non-probability sampling technique. Non-ambulatory children were weighed using a digital scale (tare method) and their recumbent length or standing height were measured. BMI was determined as weight (kg) divided by height (m²) and BMI-for-age z scores were obtained by using WHO AnthroPlus software. Nutritional status was rated using the WHO criteria. Demographic information, type of CP, socio-economic status and feeding history were recorded using a structured proforma after obtaining informed consent. Congenital heart-lung defects, lactose intolerance and history of tuberculosis were excluded.

INCLUSION CRITERIA

Children aged 5–16 years, of either gender (male and female), with cerebral palsy since birth, diagnosed by a consultant physician according to the operational definition, were included.

EXCLUSION CRITERIA

The patients who had congenital heart–lung defects, past history of lactose intolerance, and past history of tuberculosis as found on medical records and past medical history review were excluded.

DATA COLLECTION PROCEDURE

Ethical approval and informed consent from parents were obtained and consecutive children who attended the OPD in the pediatric department were screened. The researcher completed detailed history and examination of eligible participants with consultation from the researcher's consultant. Anthropometric measurements were made using calibrated scale with tare technique (for non-standers) and length board/stadiometer for length/height. BMI was calculated and fed in the WHO AnthroPlus software for z-scores. Data for socio-demographic information, CP type (spastic, dyskinetic, ataxic, mixed), feeding history, where they lived, and parental education/income were recorded on a numbered proforma for anonymity. Nutritional counseling was provided to parents of malnourished children. Data collection was focused on accuracy and patient comfort.

DATA ANALYSIS

All data were analysed and entered into SPSS 20. Continuous variables like age and BMI were expressed as mean $\pm$ standard deviation. Categorical variables such as socioeconomic groups, nutritional status, CP type and gender were expressed as frequencies and percentages. To control for effect modifiers, stratification was done by age, gender, socioeconomic status, residence, and CP type. The associations between variables and nutritional status were tested using chi-square or Fisher's exact test. A p value of < 0.05 was deemed significant. The results were presented in tabular form and figures for easy interpretation.

RESULTS

The total number of children who were enrolled into the study had CP was 158. The ages of the participants ranged from 5 to 16 years and the mean was 9.4 ± 3.2 years. There were 92 (58.2%) males and 66 (41.8%) females. The most common type of cerebral palsy was spastic CP (68.4%). The average BMI z score of the study population was -1.87 ± 1.62 .

Table 1. Basic demographics of the study population (n = 158) are presented.

Variable	Frequency (%) / Mean $\pm$ SD
Total participants	158
Age (years)	9.4 ± 3.2
Age range	5–16 years
Male	92 (58.2%)
Female	66 (41.8%)
Mean BMI z-score	-1.87 ± 1.62

Table 2. The distribution of the subtypes of Cerebral Palsy is shown in this chart.

Cerebral Palsy Type	Frequency (n)	Percentage (%)
Spastic	108	68.4
Mixed	29	18.3
Dyskinetic	14	8.9
Ataxic	7	4.4
Total	158	100

Table 3. The nutritional status of children with CP.

Nutritional Status	Frequency (n)	Percentage (%)
Normal	77	48.7
Moderate malnutrition	36	22.8
Severe malnutrition	40	25.3
Obesity	5	3.2
Total	158	100

Table 4. Malnutrition and clinical and sociodemographic parameters.

Variable	p-value	Statistical Significance
Spastic quadriplegia	<0.001	Significant
Low/poor quality of life	0.013	Significant
Rural residence	0.034	Significant
Parental illiteracy	0.028	Significant
Gender	0.420	Not significant

Table 5. Nutritional Outcomes: Summary

Variable	Value
Normal nutritional status children	77 (48.7%)
Children with any malnutrition (moderate + severe)	76 (48.1%)
Children with obesity	5 (3.2%)
Mean BMI z-score	-1.87 ± 1.62
Most common CP subtype	Spastic (68.4%)

Total number of children with cerebral palsy in the study = 158. The mean age was 9.4 ± 3.2 years, with 92 (58.2%) males and 66 (41.8%) females. The most common type of cerebral palsy was spastic CP (68.4%), mixed (18.3%), dyskinetic (8.9%) and ataxic (4.4%).

The nutritional status of the children was determined and 77 (48.7%) children were normal, 36 (22.8%) were moderately malnourished and 40 (25.3%) were severely malnourished. There were 5 children (3.2%) who were obese. Overall, 48.1% of the respondents were moderately to severely undernourished. The overall mean BMI z score was -1.87 ± 1.62 , suggesting that there was a high undernutrition burden in the study population.

Severe malnutrition was a statistically significant finding with spastic quadriplegia ($p < 0.001$), lower socioeconomic status ($p = 0.012$) and rural dwelling ($p = 0.034$) and parental illiteracy ($p = 0.028$). There was no association of nutrition status with gender ($p = 0.420$).

The findings from this work demonstrate that malnutrition is a significant problem among children with cerebral palsy, especially among children with more severe motor function impairments and with lower socioeconomic status. These results emphasize the need for periodic nutrition screening, early nutrition interventions and multidisciplinary approach to improve growth and health outcomes of this vulnerable group.

DISCUSSION

In the present study, it has been shown that malnutrition is one of the main health problems affecting children with CP as 48.1% of the children were found to be moderately and severely malnourished. The findings are in accordance with the data from around the world indicating that feeding difficulties, increase in energy expenditure and motor dysfunction are among the most common comorbidities in CP, related to nutritional impairment [1]. Nutritional assessment is an important

component of clinical management of cerebral palsy as nutritional problems are of frequent occurrence, often related to the feeding problem, growth failure and/or nutritional deficiencies and are often associated with the disorder of movement and posture, which is permanent [2]. Furthermore, there is now recognition that other impairments that can be linked to CP, including sensory, cognitive and feeding impairments, contribute to poor nutritional outcomes [3].

The most common type in our study was spastic CP (68.4%) and this is in line with the finding from Ethiopia that spastic CP was the most common type of CP with higher level of disability and the nutritional problems [4]. Almost one-quarter of the participants were severely malnourished, and 22.8% moderately malnourished. Similarly, BMI-for-age z-scores can be helpful in nutrition assessment and monitoring as the same BMI-based nutritional deficits were also observed in children with CP in Korea [5]. In our study, the prevalence of malnutrition is also comparable to that of other similar studies conducted in Nigeria which reported that children with CP had very high rates of malnutrition (moderate and severe) particularly those with severe motor impairment [6]. Likewise, in a study in Saudi Arabia, it was concluded that approximately 50% of children with CP had nutritional problem and that feeding difficulties, motor disability were the main causes of poor nutrition [7]. The figures from the Nepal Cerebral Palsy Register also indicated that there were high rates of undernutrition particularly among children with severe motor impairments and limited access to nutrition support services [8].

In the current study, being in the lowest socio-economic status was significantly related to severe malnutrition. This has been observed in Uganda, where poverty, caregiver limitations and inadequate health care access had a negative effect on the nutrition of children with CP [9]. The historical definition and classification of CP also serve to emphasize the idea that CP is a non-progressive disorder of brain development and thus a lifelong disorder of movement and posture, and that it is often complicated by feeding, growth and health impairments, therefore making assessment of nutrition a fundamental component of routine clinical management [10].

Feeding and swallowing problems are a significant problem in CP. Oral motor dysfunction, feeding times and dysphagia have significant implications on the intake of energy and normal growth [11]. Nutrition interventions early in life can have a significant impact on nutrition status. In a randomized controlled trial, there was significant improvement in weight gain and functional outcomes with high calorie nutritional formula compared to conventional nutritional management [12]. Furthermore, oral feeding difficulties and inadequate oral hygiene are other factors that may affect the nutrition intake of children with severe neurological disabilities, such as cerebral palsy, and an in-depth assessment of nutrition status should be performed. [13] Despite the fact that children and adolescents with CP continue to receive medical care, there is recent evidence that they continue to have poor dietary intakes, suggesting that dietary monitoring should persist through childhood [14].

Furthermore, the Global LMIC Cerebral Palsy Register also reported that malnutrition is more of an issue among children with CP in LMICs, which also calls for nutritional support programmes in resource-limited countries [15]. In India, a recent study also revealed that malnutrition was linked with severe motor impairment, feeding problems and the low socioeconomic status, being similar with the findings of the present study [16]. Similarly, Brooks et al. have demonstrated strong correlation between nutritional status (and growth failure) and increased motor dysfunction, and that it is a powerful predictor for morbidity and mortality in children with cerebral palsy. They emphasize that regular monitoring of growth and timely nutritional interventions to support children's growth are essential for integrated management of CP even in specialized health care settings [17]. A recent scoping review also revealed that screening for nutritional risk and nutritional assessment need to be routinely part of general CP management. Early identification of nutrition problem by

using validated nutrition screening tools allows nutrition intervention at the earliest stage, tailored nutrition care and interdisciplinary approach to improve nutrition status and health outcomes of children [18].

The strengths of the present study were that the anthropometric measurements were followed in a standardization and the nutritional status assessment was performed using the WHO AnthroPlus software that allowed the ascertainment of the nutritional status in an internationally comparable manner. However, the results might not be generalizable beyond this one center and a cross-sectional design does not allow for causal inferences. In addition, detailed dietary intake, Gross Motor Function Classification System (GMFCS) level, and swallowing tests and status on micronutrients were not performed. Longitudinal studies with more extensive nutritional and functional assessment for longer duration is recommended and should be performed multi-center for more understanding of the disease and the efficacy of the targeted nutritional intervention.

CONCLUSION

This study shows that there is a significant malnutrition among children with cerebral palsy attending tertiary care hospital in Peshawar where almost half (49.4%) children were moderately to severely undernourished. The most severely malnourished were those with spastic subtypes, lower socioeconomic status, and rural people, especially children. These results highlight the essential importance of systematic nutrition screening based on BMI-for-age Z scores as well as multi-disciplinary care by pediatricians, nutritionists and caregivers. Early intervention with dietary counseling, supplementation, and feeding therapy may have a significant impact on the growth of this vulnerable population, decrease complications, and improve quality of life. In Pakistan, nutritional support programmes should be the focus of policy makers which should be linked with CP management at tertiary and community level. Long-term outcomes are suggested to be evaluated using longitudinal study, after implementing targeted interventions. Malnutrition is a critical issue in CP and needs to be addressed to maximize neurodevelopmental potential and minimize healthcare burden.

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