The Effect of Nutrition Education on Nutritional Knowledge Levels of Parents of Children with Cerebral Palsy*

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Abstract

Aim: This study aimed to evaluate the effectiveness of a nutrition education program on the nutritional knowledge levels of parents/caregivers and to assess the nutritional status of children with cerebral palsy (CP).

Method: The study was conducted with 19 children aged 2–18 years with CP and their parents/caregivers. Height and weight were measured using knee height (KH) and mid-upper arm circumference (MUAC) measurements. To assess nutritional status, parents completed a questionnaire, and a 24-hour dietary recall was collected and evaluated using the BeBiS 8.2 program, with reference to the Turkish Dietary Guidelines (TÜBER, 2022). Risk of nutritional impairment was assessed using the Tool for Risk of Impaired Nutritional Status and Growth (STRONGkids), and swallowing function was assessed using The Pediatric Version of the Eating Assessment Tool (PEDI-EAT-10). Nutrition education was provided to parents, and a 20-question pre- and post-education test was administered to measure changes in knowledge levels. The education was delivered via video recording. Data were analyzed using descriptive statistics and non-parametric tests, with $p<0.05$ considered statistically significant.

Results: The average age of the 19 children in the study was 7.9±3.6 years, and 10.5% were classified as having severe thinness. According to TÜBER (2022), 63.2% of children had excessive energy and fat intake, while calcium, folic acid, and vitamin D intake were insufficient. The effectiveness of the nutrition education given to the parents was analyzed. The mean pre-test score was 15.5, while the mean post-test score increased to 18.0 ($p=0.009$).

Conclusion: The nutrition education provided significantly increased parents' nutritional knowledge. Parents of children with CP require ongoing nutritional information and support. Therefore, nutrition

Özgün Araştırma Makalesi (Original Research Article)
Geliş / Received: 02.01.2025 **Kabul / Accepted:** 11.03.2026
DOI: https://doi.org/10.38079/igusabder.1611913
* TUBİTAK 2209-A University Students Research Projects Support Program has funded this study. Project number: 1919B012306639.
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ETHICAL STATEMENT: Ethics committee permission for the study was received from the Marmara University Ethical Committee (Date:30/11/2023, Number: 2023/106), and the principles of the Declaration of Helsinki conducted the study.

education programs should be developed and implemented by multidisciplinary teams to meet the needs of these families.

Keywords: Cerebral palsy, child, nutritional status, nutrition education.

Beslenme Eğitiminin Serebral Palsili Çocukların Ebeveynlerinin Beslenme Bilgi Düzeyine Etkisi

Öz

Amaç: Bu çalışmanın amacı, beslenme eğitimi programının ebeveynlerin/bakım verenlerin beslenme bilgi düzeyi üzerindeki etkinliğini değerlendirmek ve serebral palsili (SP) çocukların beslenme durumunu değerlendirmektir.

Yöntem: Çalışma, serebral palsili 2–18 yaş arası 19 çocuk ve ebeveynleri/bakım verenleriyle yürütülmüştür. Boy uzunluğu ve vücut ağırlığı, diz yüksekliği ve üst orta kol çevresi ölçümleriyle belirlenmiştir. Beslenme durumunu değerlendirmek amacıyla ebeveynlere anket uygulanmış, 24 saatlik besin tüketim kaydı alınarak BeBiS 8.2 programı ile Türkiye Beslenme Rehberi (TÜBER, 2022) referans alınarak değerlendirilmiştir. Beslenme bozukluğu riski Bozulmuş Beslenme Durumu ve Büyüme Riski Aracı (STRONGkids), yutma fonksiyonu ise Pediatrik Yeme Değerlendirme Aracı (PEDI-EAT-10) ile değerlendirilmiştir. Ebeveynlere beslenme eğitimi verilmiş, bilgi düzeyindeki değişimi ölçmek için eğitim öncesi ve sonrası 20 soruluk test uygulanmıştır. Eğitim, video kayıt yöntemiyle gerçekleştirilmiştir. Veriler tanımlayıcı istatistikler ve parametrik olmayan testler kullanılarak analiz edildi ve $p<0.05$ anlamlı kabul edilmiştir.

Bulgular: Çalışmaya dahil edilen 19 çocuğun yaş ortalaması 7,9±3,6 yıl ve çocukların %10,5'i zayıf kategorisindedir. Çocukların TÜBER (2022)'e göre %63,2'sinde aşırı enerji ve yağ alımı görülürken kalsiyum, folik asit ve D vitamininin yetersiz alındığı görülmüştür. Ebeveynlere verilen beslenme eğitiminin etkinliği analiz edilmiştir. Ön test ortalama puanı 15,5 iken son test ortalama puanı 18' e yükselmiştir (p=0,009).

Sonuç: Verilen beslenme eğitimi, ebeveynlerin beslenme bilgi düzeyini anlamlı şekilde artırmıştır. Serebral palsili çocukların ebeveynlerinin beslenme konusunda sürekli bilgi ve desteğe ihtiyaçları vardır. Bu nedenle, bu ailelerin gereksinimlerini karşılamak için multidisipliner ekipler tarafından beslenme eğitimi programları geliştirilip uygulanmalıdır.

Anahtar Sözcükler: Serebral palsi, çocuk, beslenme durumu, beslenme eğitimi.

Introduction

Cerebral palsy (CP) is a neurological disorder characterized by permanent impairments in movement and posture, resulting from non-progressive brain damage that occurs during the prenatal, perinatal, or postnatal periods[1]. In addition to motor dysfunction in CP, gastrointestinal problems, epileptic seizures, vision, hearing, genitourinary, sucking, chewing, and dental problems, and drooling can be seen[2].

Nutrition in children with CP has become a developmental and health problem that can start from birth and continue throughout life[3]. These children are more likely to have malnutrition than their healthy peers, and the causes include gastroesophageal reflux, swallowing disorders, and regurgitation[4]. Feeding problems can occur at all stages of food preparation, including oral intake, swallowing, and digestion[1]. Feeding problems in

CP significantly increase both mortality and morbidity[5,6]. Children with CP have been found to have energy requirements that are 60-70% of those of their healthy peers due to mobility limitations[7]. There is no sufficient evidence that children with CP and other neurological disorders have different protein requirements than their healthy peers. However, those with severe malnutrition are advised to receive an additional 2 g/kg/day of protein for optimal growth[8]. In this population, where starting nutritional management as soon as possible is the basis of optimal growth, it is necessary to determine the energy requirement accurately[9]. Ensuring adequate energy and nutrient consumption improves the general health status of children[10]. Children with CP may have swallowing and chewing difficulties, leading to prolonged meal times. Their mothers spend 3.5 to 7.5 hours daily on feeding, while mothers of healthy children spend only 48 minutes. Muscle tone disorders, swallowing, chewing, and sucking difficulties are common in children with CP, making adequate nutrition challenging and increasing the risk of malnutrition or obesity. Digestive issues, prolonged feeding times, inappropriate positioning, and dependence on caregivers further compromise adequate nutrient intake. Educating parents on nutrition, positioning, food selection, and swallowing safety can improve nutritional status and reduce complications[11-13].

Nutritional knowledge, attitudes, and behaviors of parents/caregivers affect children's food choices and reduce the incidence of health problems[14]. Nutrition education is important for determining the types and amounts of foods consumed, processing and consuming them appropriately, meeting daily needs, and preventing problems seen in adulthood[15]. Children with CP face a high risk of nutritional deficiencies, requiring careful dietary monitoring. Collaboration among physicians, dietitians, and physiotherapists is essential to educate families/caregivers. Nutritional problems caused by impaired oral motor functions or the lack of nutritional knowledge of parents/caregivers should be eliminated[4].

The objective of this study was twofold: firstly, to determine the nutritional knowledge level of parents/caregivers and to assess the effectiveness of nutrition education in improving their knowledge; and secondly, to evaluate the nutritional status of children with CP and to describe the baseline nutritional status of children with CP and to evaluate changes in the nutritional knowledge of parents/caregivers following the education program.

Material and Methods

Research type

This educational intervention study was conducted to assess the nutritional status of children with CP and to evaluate the effect of nutrition education provided to parents/caregivers on their level of nutritional knowledge.

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Study design and participants

The sample size was calculated as 27 participants based on a power analysis conducted using G*Power software (version 3.1.9.7). The analysis was performed with an assumed effect size of 0.25, a Type I error rate of $\alpha = 0.05$, and a test power of $1-\beta = 0.80$[16]. Of the 27 participants initially enrolled, 8 were excluded due to incomplete data or withdrawal from the study, primarily because of time constraints or medical reasons. Consequently, the study was completed with 19 participants (6 females, 13 males). A post-hoc power analysis using G*Power (paired t-test; dz=0.5; α=0.05; n=19) yielded a noncentrality parameter of 2.179, a critical t-value of 1.734 (df=18), and an achieved power of approximately 0.67 (67%). Therefore, the study did not reach the planned statistical power of 80%, and the non-significant results should be interpreted with caution. It included children aged 2–18 with CP and feeding difficulties, along with willing parents. Those fed non-orally, with other chronic diseases, or unwilling to participate were excluded. The study took place in a rehabilitation center in Istanbul from March to May 2024.

Data collection tools and evaluation

At the beginning of the study, the sociodemographic characteristics and dietary habits of the parents/caregivers were assessed using a questionnaire created by Sabuncular (2013)[17]. In addition, the questionnaire prepared by the researchers for children, which asked about age, gender, anthropometric measurements, general health status, and the child's nutritional status, was administered to parents/caregivers through face-to-face interviews.

Children's height (cm), body weight (kg), mid-upper arm circumference (MUAC) (cm), and knee height (KH) (cm) were measured or calculated by the researchers according to the standards. For mid-upper arm circumference measurement; the arm is bent at a 90-degree angle at the elbow, measured with a tape measure from the midpoint between the acromion process at the shoulder and the olecranon process at the elbow. Knee height is defined as the distance from the sole of the foot to the front surface of the thigh bone; this distance was measured with a tape measure with the ankle and knee bent at a 90° angle[18]. Since the children could not assume a fully horizontal position, their height was calculated using the equation (2.69xKH)+24.2 (± 1.1 cm margin of error), which provides a height estimate based on KH developed by Stevenson[19].

Body weight data for children under 6 years of age were obtained from medical records, including regular measurements taken at the rehabilitation center where they were enrolled. For males aged 6 years or older, equations based on body weight estimation from KH and MUAC were used: (KHx0.68) + (MUACx2.64) - 50.08; for females, the equations developed were (KHx0.77) + (MUACx2.47) - 50.16[19].

The body mass index (BMI) was computed using the following formula: weight (kg)/height (m)^2. According to the BMI percentile values (WHO MGRS, 2006/2007), which are organized by age and gender of children, <3rd percentile indicates severe

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thinness, 3-15th percentile indicates at risk of thinness, 15-85th percentile indicates normal, 85-97th percentile indicates overweight, and >97th percentile indicates obesity[20].

The Tool for Risk of Impaired Nutritional Status and Growth (STRONGkids) is a tool designed by Hulst et al. (2010) to assess the risk of malnutrition in children. It was validated by Pars et al. (2020) in Turkey and was used. STRONGkids consists of 4 items evaluated as 1-2 points for each item; 0 points are considered low nutritional risk, 1-3 points as moderate nutritional risk, and 4-5 points as high nutritional risk[21,22].

The children's consumption records were obtained via a 24-h dietary recall. "Food and Nutrition Photo Catalog: Measurements and Quantities" book was used to determine the amount of food consumed[23]. Food consumption was analyzed using Nutrition Information Systems Package Programs 8.2 (BeBIS 8.2)[24] to determine the daily energy and nutrient intake. Energy and nutrient intakes were evaluated by comparing them with the Turkish Dietary Guidelines (TUBER)[25] reference values. Since the daily energy and nutrient requirements of children with CP are 60-70% of those of their healthy peers, the rates of energy and nutrient intake were evaluated as inadequate (<60%), adequate (60-70%), and excessive (>70%) of their healthy peers' requirements[26].

The Pediatric Version of the Eating Assessment Tool (PEDI-EAT-10), which was originally designed by Belafsky et al. (2008) and later adapted from the EAT-10 by Serel Arslan et al. (2018)[27,28]. The PEDI-EAT-10 instrument comprises 10 items, each assigned a score ranging from 0 to 4. A score of 0 indicates "No problem," while a score of 4 indicates "Severe problem". In the total score, 0-3 is categorized as no risk and 3-40 as high risk for swallowing function.

Researchers created 20 questions to assess the knowledge of CP nutrition of parents/caregivers, based on a literature review; however, formal validity and reliability analyses were not conducted[25,29-34]. These questions were asked to the parents/caregivers before and after the training. It was determined that each correct response would be awarded 1 point, and the overall score would be determined by the sum of correct answers.

Nutrition education

Nutrition education was provided through video recordings and presentations, covering basic nutrition principles, healthy eating, CP-specific needs, and common nutritional issues. Researchers recorded three 10-minute training videos. The educational materials were developed by the authors, who are dietitians experienced in pediatric nutrition, and were delivered by the authors İ.B., E.S., and Ş.U.

Topics of the first educational video: Nutrition in CP: Definition of Nutrition, Food Groups, Nutrition in CP, What is Malnutrition, Causes and Consequences of Malnutrition, Recommended Daily Macronutrient Portions.

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Topics of the second educational video: General Nutrition Recommendations: Healthy Plate Model, Foods to Increase Consumption, Foods to Reduce Consumption, Healthy Cooking Methods, Food Safety and Hygiene, Principles to Consider When Buying Food, Principles to Consider When Storing Food.

Topics of the third educational video: Nutrition in Dysphagia, Food Consistencies, and Foods that may pose a Choking Hazard.

Parents/ caregivers received the training videos after the pre-test was administered. After the parents had watched the videos, they were contacted again, and the post-test was administered.

Ethical Statement

The study was granted ethical approval by the Non-Interventional Clinical Research Ethics Committee of Marmara University's Faculty of Health Sciences (protocol number 106, dated 30/11/2023). Permission in the form of a written document was also obtained from the center where the study was conducted. TUBITAK 2209-A University Students Research Projects Support Program has funded this study. Project number: 1919B012306639.

Statistical Evaluation of Data

The study data were evaluated using SPSS (Statistical Package for the Social Sciences; SPSS Inc., Chicago) version 22. The data conformed to normal distribution, as evaluated by histogram graphs, central and prevalence criteria, and the One-Sample Kolmogorov-Smirnov Test. The Chi-Square Test was applied to examine relationships between categorical variables. The Wilcoxon Signed-Rank Test was employed to compare paired non-normally distributed data. A significance level of $p < 0.05$ was considered statistically significant for all analyses.

Results

The present study comprised 19 children aged 2-18 years with CP, along with their parents/caregivers. The study group comprised 68.4% males and 31.6% females, with a mean age of 7.9±3.6 years. 57.9% of the children were born with low birth weight, and 84.2% were premature. The mean age of the mothers was 37.2±8.2 years; the mean age of the fathers was 40.2±7.8 years. While 47.4% of the mothers had a high school education, 31.6% of the fathers had primary education, and 36.8% had secondary education. 15.8% of the mothers and 5.3% of the fathers had chronic diseases (Table 1).

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Table 1. The general characteristics of children and their parents

The General Characteristics of Children	**n**	**%**		
Gender				
Male	13	68.4		
Female	6	31.6		
Age (year)				
Mean (SD)	7.9(±3.6)			
Min-Max	2-14			
Birth weight (g)				
Low birth weight (<2500)	11	57.9		
Normal birth weight (2500-4000)	8	42.1		
High birth weight (>4000)	0	0		
Duration of Pregnancy (weeks)				
Late preterm (24-31 weeks)	5	26.3		
Moderate preterm (32-36 weeks)	10	52.6		
Preterm (36-37 weeks)	1	5.3		
Full Term	3	15.8		
The General Characteristics of Parents	**Mother**		**Father**	
	n	**%**	**n**	**%**
Age (year)				
Mean (SD)	37.2(±8.2)		40.2(±7.8)	
Min-Max	21-50		24-54	
Education status				
Primary education	7	36.8	6	31.6
Secondary education	1	5.3	7	36.8
High school	9	47.4	4	21.1
Higher education	2	10.5	2	10.5
Chronic disease				
Present	3	15.8	1	5.3
Absent	16	84.2	18	94.7
Inherited disease				
Present	-	-	-	-
Absent	19	100	19	100

The prevalence of severe thinness among children was 10.5%, while 47.3% were classified as normal weight. Furthermore, 15.7% were identified as overweight, and 21% were categorized as obese based on their BMIs. The mean body weight of males and females was 25.5±14.9 kg and 23.5±12.3 kg, respectively. The mean height of males and females was 114.7±24.3 cm and 110.9±24.4 cm, respectively (Table 2).

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Table 2. Anthropometric measurements of children

	Male		Female		Total	
	n	**%**	**n**	**%**	**n**	**%**
BMI						
Severe thinness	1	7.7	1	16.6	2	10.5
Thinness	1	7.7	-	-	1	5.5
Normal	7	53.8	2	33.4	9	47.3
Overweight	1	7.7	2	33.4	3	15.7
Obesity	3	23.1	1	16.6	4	21
	Mean (SD)	**Min-Max**	**Mean (SD)**	**Min-Max**	**Mean (SD)**	**Min-Max**
Body weight (kg)	25.5(±14.9)	11-58	23.5(±12.3)	13-46	24.9(±13.8)	11-58
Height (cm)	114.7(±24.3)	80-168	110.9(±24.4)	83-141	113.5(±23.7)	80-168

The most common feeding problems among the children were food indifference (26.3%), followed by food refusal and cough (21%; Table 3). None of the children used medication for feeding problems.

Table 3. Frequency of occurrence of nutrition problems

	Frequently (1-3 times a day)		Rarely (1-3 times a week)		None	
	n	**%**	**n**	**%**	**n**	**%**
Constipation	2	10.5	2	10.5	15	79
Aspiration	1	5.3	-	-	18	94.7
Retching	1	5.3	-	-	18	94.7
Gagging	2	10.5	2	10.5	15	79
Choking	1	5.3	2	10.5	16	84.2
Cough	4	21	3	15.8	12	63.2
Indifference to food	5	26.3	3	15.8	11	57.9
Food refusal	4	21	3	15.8	12	63.2

In the STRONGkids test, 92.3% of males and all females were medium-risk, while 7.7% of males were low-risk. According to PEDI-EAT-10, 66.7% of females and 53.8% of males were at risk. No significant differences were found in STRONGkids and PEDI-EAT-10 scores by gender ($p > 0.05$). Among children without swallowing risk, 87.5% were classified as being at medium risk of malnutrition, and all children with swallowing risk were also classified as being at medium risk. No significant association was observed between malnutrition risk and swallowing function ($p = 0.421$) (Table 4).

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Table 4. Comparison of malnutrition status with swallowing function

	Female		Male		
	n	**%**	**n**	**%**	**p**
STRONGkids					
Low risk (0 points)	-	-	1	7.7	1.000
Moderate risk (1-3 points)	6	100	12	92.3	
High risk (4-5 points)	-	-	-	-	
PEDI-EAT-10					
Risk absent (0-3 points)	2	33.3	6	46.2	0.659
Risk present (3-40 points)	4	66.7	7	53.8	
	PEDI-EAT 10				
	Risk absent (0-3 points)		**Risk present (3-40 points)**		**p**
STRONGkids	**n**	**%**	**n**	**%**	
Low risk (0 points)	1	12.5	-	-	0.421
Moderate risk (1-3 points)	7	87.5	11	100	
High risk (4-5 points)	-	-	-	-	

Analyses were performed using the Chi-square test.

While 63.2% of children exceeded their energy needs, 33.3% females and 23.1% of males had insufficient intake. In protein, 50% of females had excessive intake, 33.3% insufficient, while 61.5% of males had sufficient intake and 30.8% excessive intake. Excessive fat intake was seen in 83.3% of females and 53.8% of males. Fiber intake was similar, with 57.9% excessive and 36.8% insufficient. Folate deficiency affected 66.7% of females and 30.8% of males. All females and 84.6% of males lacked vitamin D (Table 5).

Table 5. The status of energy and nutrient intakes in meeting the requirements of children with CP according to gender

	Female		Male		Total		
	n	**%**	**n**	**%**	**n**	**%**	**p**
Energy							
Insufficient intake	2	33.3	3	23.1	5	26.3	0,655
Sufficient intake	-	-	2	15.4	2	10.5	
Excessive intake	4	66.7	8	61.5	12	63.2	
Carbohydrate							
Insufficient intake	2	33.3	5	38.4	7	36.8	0.682
Sufficient intake	2	33.3	6	46.2	8	42.1	
Excessive intake	2	33.3	2	15.4	4	21.1	
Protein							
Insufficient intake	2	33.3	1	7.7	3	15.8	0.214
Sufficient intake	1	16.7	8	61.5	9	47.4	
Excessive intake	3	50	4	30.8	7	36.8	
Fat							
Insufficient intake	-	-	-	-	-	-	0.333
Sufficient intake	1	16.7	6	46.2	7	36.8	

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Excessive intake	5	83.3	7	53.8	12	63.2	
Fiber							
Insufficient intake	3	50	4	30.8	7	36.8	0.745
Sufficient intake	-	-	1	7.7	1	5.3	
Excessive intake	3	50	8	61.5	11	57.9	
Folate (Vit. B9)							
Insufficient intake	4	66.7	4	30.8	8	42.1	0.259
Sufficient intake	-	-	4	30.8	4	21.1	
Excessive intake	2	33.3	5	38.4	7	36.8	
Vitamin D							
Insufficient intake	6	100	11	84.6	17	89.4	1.000
Sufficient intake	-	-	1	7.7	1	5.3	
Excessive intake	-	-	1	7.7	1	5.3	
Iron							
Insufficient intake	3	50	2	15.4	5	26.3	0.246
Sufficient intake	-	-	4	30.8	4	21.1	
Excessive intake	3	50	7	53.8	10	52.6	
Calcium							
Insufficient intake	4	66.7	5	38.4	9	47.4	0.505
Sufficient intake	-	-	2	15.4	2	10.5	
Excessive intake	2	33.3	6	46.2	8	42.1	

Analyses were performed using the Chi-square test

*According to TUBER, the requirements of their peers

< %60 Insufficient intake; %60-70 Sufficient intake; >%70 Excessive intake

The mean post-test score increased significantly compared to the pre-test score (15.5±2.3 vs. 18.0±1.8), with 82% of participants showing an increase in their scores (p= 0.009) (Table 6).

Table 6. The effect of nutrition education provided to parents

Evaluation of nutrition education	**n**	**%**	**p**
Pre-test > Post-test	1	9	0.009
Pre-test = Post-test	1	9	
Pre-test < Post-test	9	82	
	Mean (SD)		
Pre-test score	15.5(±2.3)		
Post-test score	18(±1.8)		

Analyses were performed using the Wilcoxon-Signed Rank Tests.* Pre-test score > Post-test score; Pre-test score = Post-test score; Pre-test score < Post-test score

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Discussion

In the study, nutritional issues were examined, revealing that 26.3% of children had food indifference, and 21% experienced food refusal and coughing. The study also explored the impact of nutrition education on parents' nutritional knowledge. Results showed that the mean pre-test score was 15.5, while the mean post-test score increased to 18, indicating a statistically significant improvement in nutritional knowledge after the education.

In a study conducted by Tunç et al.[35], height, body weight and BMI values of 278 children with CP were 115.55±21.81 cm, 23.54±11.56 kg, 39.91±33.53, 160 subjects (57.6%) had a BMI under 25, 71 subjects (25.5%) had a BMI within the normal range, and 47 subjects (16.9%) had a BMI in the overweight range; A study by Wang et al.[36] found that 70 of the children (18.5%) had a BMI categorized as overweight or obese (11.1% and 7.4% of the children in each category, respectively). Obesity was significantly more common in the younger age group (2-12 years). In this study, according to BMI percentiles, 10.5% of the children were underweight, 5.5% were at risk of being underweight, 47.3% were normal, 15.7% were slightly obese, and 21% were obese. The height and body weight of the children who participated in the study were 113.5 (±23.7) cm and 24.9 (±13.8) kg, respectively. The values in our study are similar to those of other studies.

However, it has been reported that in interventions focusing solely on nutrition education, although parents' feeding practices and child–caregiver interactions improve, significant changes in children's anthropometric measurements are often not observed[37].

Nutritional problems in children with CP increase dependence on caregivers. Şimşek et al.[38] found that 46.8% had feeding problems causing growth retardation, while Güldemir et al.[39] reported dysphagia (76%) and constipation (60%) as the most common issues. Costa et al.[40] noted chewing disorders in 81% of children with neurological disorders. In this study, common problems included indifference to food (94.7%), food refusal (36.9%), cough (36.9%), choking (15.8%), retching (21%), and constipation (21%). Impaired chewing and swallowing lead to food refusal, and food entering the airway can cause coughing or gagging. Sedentary lifestyle and low water intake may worsen constipation and appetite loss. Gastrointestinal disorders like reflux are also linked to growth and development[41,42].

Education on constipation management, including dietary and physiological strategies targeting factors such as immobility, poor posture, and inadequate fiber or fluid intake, has been shown to improve caregivers' problem-solving skills regarding bowel management in children with CP. Moreover, highlighting the adverse impact of nutritional status on respiratory function, previous educational interventions have emphasized the potential role of effective nutritional management in reducing respiratory morbidity among children with CP[43].

Food refusal and digestive problems in children with CP cause malnutrition, leading to growth delay, poor quality of life, and early mortality. Their energy needs are 60–70% of

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healthy peers. Ülker et al.[18] found that 72.4% of children with CP had insufficient energy intake. In this study, 63.2% had excessive and 26.3% had inadequate energy intake, likely due to high fat consumption. However, since the 24-h dietary recall relies on memory, reported intake may not reflect usual consumption.

In a study by Örnek et al.[44] involving 200 children with neurological disorders, the STRONGkids screening test was used to assess malnutrition risk. Results showed that 45% were at low risk, 40% at medium risk, and 15% at high risk. In this study, all girls were in the medium-risk group, while 92.3% of boys were in the medium-risk group and 7.7% were in the low-risk group.

Parents influence children's eating habits through food choices and meal structure. For children with CP, nutritional difficulties underscore the importance of parental awareness. In this study, the effectiveness of nutrition education was evaluated using pre- and post-tests; 82% of parents scored higher after training. The mean score increased from 15.5 to 18.0 ($p=0.009$), showing improved nutritional knowledge. These results emphasize the need for ongoing nutrition education and support programs for caregivers of children with CP.

Previous studies have demonstrated that caregiver training-including components such as nutrition education, feeding position, and practical meal preparation-leads to improvements in feeding skills, enhanced caregiver–child interaction, and reduced caregiver stress. These interventions may improve the child's feeding experience and, in turn, reduce nutritional risk. Moreover, interventions that combine dietary modification and parental education have been associated with better nutritional outcomes (e.g., improved anthropometric measurements and reduced malnutrition rates) compared with interventions targeting feeding skills or behavioral change alone[30]

The researchers gave parents a detailed explanation of the study's purpose, methodology, timeframe, and voluntary participation. Parents then signed the informed consent form.

Study Limitations

The sample consisted of children with CP from a single centre, and the overall number of participants was modest; therefore, the findings should be interpreted with appropriate caution. Although comprehensive baseline anthropometric and nutritional assessments were successfully completed, several families were unable to participate in the post-intervention evaluation because of the considerable caregiving responsibilities and frequent medical appointments associated with CP. Consequently, post-intervention anthropometric measurements could not be repeated, and changes in children's nutritional status, as well as their potential association with parental nutrition knowledge, could not be examined. Additionally, the malnutrition screening tool utilised in this study has not yet been specifically validated for paediatric CP populations, emphasising the importance of developing condition-specific, reliable assessment instruments. Finally, the nutrition knowledge questionnaire used in this research has not undergone formal psychometric validation. These considerations highlight areas for

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refinement in future studies and support the relevance of the preliminary findings presented here.

Conclusion

The results show that, despite the problems children experience with their eating habits and nutritional status, parents rarely seek help from dietitians. This underscores the need for effective interventions and support programs to address the nutritional needs of children with CP. It is imperative that pediatric patients suffering from CP undergo regular monitoring by a multidisciplinary team of physicians, dietitians, physiotherapists, psychologists, and nurses to improve their nutrition and support their growth and development.

Acknowledgments

This research was supported by the TUBITAK 2209-A program. The authors sincerely thank TUBITAK for their support.

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