

Factors Affecting the Nutritional Habits of Cerebral Palsy Patients

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Abstract

Background: Cerebral palsy (CP) is a motor control and postural disorder. Feeding problems in children with CP increase the risk of morbidity and mortality by leading to malnutrition and growth retardation. In this study, we aimed to investigate the factors affecting the dietary habits of patients with CP.

Methods: Patients with CP who participated in the rehabilitation program in Medipol University Department of Physical Medicine and Rehabilitation were included in the study. The dietary habits of the patients were evaluated and biceps, triceps, and subscapular skin thickness, mid-upper arm circumference was measured. Beck depression inventory (BDI) was filled in by all mothers. The study included 29 patients with CP (16 males and 13 females with a mean age of 3.9 ± 3.1).

Results: No correlations were found between biceps, triceps and subscapular skin thickness, mid-upper arm circumference, maternal depression level, and eating habits. There were statistically significant correlations between the gross motor functional classification system (GMFCS) and saliva ($r:0.396$, $p:0.008$), reflux ($r:0.142$, $p:0.046$), constipation ($r:0.361$, $p:0.044$), gas presence ($r:0.483$, $p:0.008$), and mid-upper arm circumference ($r:0.483$, $p:0.008$).

Conclusion: These results indicate that nutritional problems increase as the level of functional disability increases.

Key words: Cerebral Palsy, Dietary, Skin Thickness, Nutritional Problems.

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INTRODUCTION

Cerebral palsy (CP), the result of a nonprogressive injury that develops in utero process, during birth process or during the first 3 years of life, is a motor control and postural disorder (1). The average incidence rate is reported to be 2–3 of 1,000 live births (2). In addition to motor control disorder, children with CP may experience mental health issues, epileptic seizures, and gastrointestinal illnesses; oromotor, sucking, chewing, dental, drooling, vision, hearing, and genitourinary problems can also accompany the disease (3). Feeding problems in children with CP increase the risk of morbidity and mortality by leading to malnutrition and growth retardation (4).

Although the expected lifetime of CP patients varies according to the child's functional level, the most important determinants are mobility and nutrition (5). Other health problems resulting from nutritional difficulties include malnutrition, esophagitis, recurrent chest infections and progressive lung disease. Most children with CP at risk for these problems are spastic quadriplegic and dystonic (6). Stallings et al. reported that the development of children with diplegic or hemiplegic CP is directly related to their nutritional status and recommended that they be followed periodically (7).

Another study conducted with children who have spastic quadriplegic CP demonstrated that developmental criteria correlated significantly with nutritional levels (8). The diagnosis of nutritional disorders as well as specific treatment, prevention of malnutrition, and complications related to nutritional problems are very important. In this study, we aimed to investigate the factors affecting the dietary habits of patients with CP.

MATERIALS AND METHODS

The study was conducted in accordance with the principles of the Declaration of Helsinki and the protocol was approved by the İstanbul Medipol University Non-Interventional Ethics Committee (Date: 14.02.2018; Decision Number: 115).

Patients with CP who participated in the rehabilitation program in Medipol University Department of Physical Medicine and Rehabilitation were included in the study. The parents of all participants were informed about the purpose of the study and the procedures and informed consents were obtained. The demographic data of

participants were recorded in patient follow-up forms. Body weights and heights were measured, and the patients were questioned regarding their diet and the number of meals consumed per day.

Issues such as loss of appetite, nausea, vomiting, diarrhea, difficulty in chewing, recurrent pneumonia, prolonged feeding times; mouth sores, excess saliva, and gas complaints were addressed. Biceps, triceps, and subscapular skinfold thicknesses were measured with a caliper. The patient's elbow was flexed at 90° in the triceps skinfold thickness measurement, and the midpoint between the acromion and olecranon protrusions was marked. After the marked location was held with thumb and index finger, the measurement was completed with a caliper. The biceps skinfold thickness was measured from the anterior side of the arm to the acromion bone border and from the midline of the antecubital fossa. For the measurement of subscapular skinfold thickness, a mark was placed at the inferior corner of the scapula, and a measurement was made to the body at an angle of about 45°. For the measurement of the subscapular skinfold thickness, a mark was placed at the inferior corner of the scapula, and a measurement was made to the body at an angle of about 45°. To measure the mid-upper arm circumference, the patient's elbow was flexed to 90°, and the midpoint between the acromial overhang and the olecranon projection was marked and measured with a tape measure. The Gross Motor Functional Classification System (GMFCS) was used to determine the level of gross motor function. The five-level GMFCS is a functionality-based system developed to standardize the assessment of the gross motor function of children with CP (Table 1). At level 1, the patient can be mobilized inside and outside the home without the help of an auxiliary device; at level 5, mobilization is severely restricted even if using an auxiliary device. The Beck Depression Inventory (BDI) was completed by the mothers of all the participants. Developed by Beck et al. (1978), the BDI comprises 21 items. The depression score is assumed to increase as the level of depression increases (9).

Table 1. Gross motor function classification system (GMFCS) general headings for each level

Level 1 - Walks without Limitations
Level 2 - Walks with Limitations
Level 3 - Walks Using a Hand-Held Mobility Device
Level 4 - Self-Mobility with Limitations; May Use Powered Mobility
Level 5 - Transported in a Manual Wheelchair

Statistical Analysis

Descriptive values were made using the average, standard deviation, and percentage (%) rates using IBM SPSS 21 (IBM Corp., Armonk, NY, USA). Relations were assessed by Spearman's correlation analysis. $P < 0.05$ was considered statistically significant.

RESULTS

The study included 29 patients with CP (16 males and 13 females with a mean age of 3.9 ± 3.1). Of the 29 patients, 14 had quadriplegic CP, 7 had diplegic CP, and 8 had hemiplegic CP (Table 2). The patients' GMFCS scores reflected the following percentages: 17.2% at level 1, 10.31% at level 2, 27.6% at level 3, 20.7% at level 4, and 24.1% at level 5. In addition, 86.2% of the patients were using at least one orthosis. Based on their eating habits, 69% of the participants had a good appetite, and 31% had a poor appetite. The patients' numbers of meals per day were as follows: 13.8% had three or fewer meals, 72.4% had three to six meals, and 13.8% had more than six meals.

Table 2. Demographic and clinical characteristic of patient

Demographic and Clinical characteristic of Patient	n: 29
Male/ Female	16/13
Mean age (years)	3.9 ± 3.1
Quadriplegic cerebral palsy	14 (48%)
Diplegic cerebral palsy	7 (24%)
Hemiplegic cerebral palsy	8 (28%)

Moreover, 13.8% of the patients experienced nausea, 17.2% experienced frequent vomiting, 6.9% experienced reflux, 20.7% had gas, 37.9% had constipation, and 34.5% had saliva problems (Table 3). At the time of the study, 31% of the patients were receiving supplemental vitamins. No correlations were found between biceps, triceps, and subscapular skin thickness, mid-upper arm circumference, maternal depression level, and eating habits. There were statistically significant correlations between GMFCS and saliva ($r:0.396$, $p:0.008$), reflux ($r:0.142$, $p:0.046$), constipation ($r:0.361$, $p:0.044$), gas presence ($r:0.483$, $p:0.008$), and mid-upper arm circumference ($r: 0.483$, $p:0.008$).

Table 3. Percentage of nutritional problems in 29 cerebral palsy patients

Nutritional problem*	
Constipation	37.9%
Saliva	34.5%
Gas	20.7%
Vomiting	17.2%
Nausea	13.8%
Reflux	6.9%

*More than one nutritional problem was detected in 9 patients.

DISCUSSION

In this study, nutritional problems were found in patients with CP and are listed in order of frequency as follows: constipation, saliva, gas, vomiting, nausea, and reflux. It was observed that these problems increased as the motor functional status worsened. Constipation is a common problem in patients with CP and is caused by impaired bowel motility, irregular muscle contractions, dysfunction of rectal sphincter control, inactivity, and inadequate fluid and fiber intake. In children with CP, the colonic transit time in the left colon and rectum has been shown prolonged. In one study, 74% of children with CP had chronic constipation (10). The present study found that constipation was the most common gastrointestinal problem (37.9%). Gastroesophageal reflux (GERD) is a common problem in children with CP. Spasticity of the intraabdominal muscles, increased intra-abdominal pressure due to constipation, extended periods in the supine position, and delayed gastric emptying due to impaired gastrointestinal function and motility may trigger reflux (11).

Chronic GERD can cause esophagitis, which may lead to loss of appetite as well as aspiration (12). Problems of development and coordination of the muscles around the mouth may cause drooling, difficulty in feeding, and speech problems (13). The risk of aspiration is high for children having CP with oropharynx, larynx, or tracheal motor coordination. Children with CP often develop silent aspiration, which is defined as the passage of food downstream of the vocal cords without clinical signs or symptoms (14). Due to motor impairment, most patients with CP are dependent on others for their nutritional activities.

In children with CP, problems such as prolonged feeding times, malnutrition, aspiration of excess saliva resulting in coughing and obstruction are frequently encountered. Nutritional difficulties, growth, and growth retardation due to these problems negatively affect the lives of both children and their families. A questionnaire administered to parents can be useful in terms of the screening, detection, and treatment of children at risk for malnutrition (15-16). Studies have shown that the parents of patients with CP find it stressful to attend to the nutritional needs of their children and that they spend significant amounts of time feeding their children during the day (15-17).

In our study, 13% of the participants required more than six meals per day. The time spent on nutrition, although exhausting for families, may not always lead to satisfactory results (17). In some families, the feeding times of children are shorter due to stress, and this can lead to malnutrition, which in turn may cause the children to experience developmental delays (16). In a study conducted in Turkey, depression and quality of life in mothers of healthy children and of those with CP having similar demographic characteristics were compared. In order to evaluate The Beck Depression Inventory (BDI) and the Nottingham Health Profile (NHP) were used. The NSP subgroup scores and BDI scores were significantly higher in the mothers of children with CP. In this study, no correlations were found between the GMFCS level, the BDI, and the NHP (18). Studies have found growth retardation in children with CP (19-20). In patients with CP, motor dysfunction may also be associated with oromotor dysfunction; thus, feeding is impaired (21).

Children with CP are at high risk of malnutrition. Acute and chronic malnutrition can be seen due to a limited calorie intake (16). In our study, we measured skinfold thickness with a skinfold caliper to evaluate the nutritional status of the participants. Skinfold measurements are used to determine subcutaneous and body fat levels. Triceps skinfold thickness is an important predictor of low-fat deposition and malnutrition in patients with CP (22).

Triceps skinfold measurements are used to evaluate short-term storage in total body fat stores, and subscapular skinfold measurements are used to show long-term energy deposits (7). A study by Sullivan et al. indicated that mid-upper arm circumference measurement was a good predictor of nutritional status (23).

In our study, we examined the relationship between the nutritional status of children with CP and maternal depression. We evaluated the biceps, triceps, subscapular skinfold thickness with a skinfold caliper and measured the mid-upper arm circumference. In our study, there were no correlations between biceps, triceps, subscapular skinfold thickness, mid-upper arm circumference measurement, mothers' depression levels, and feeding habits of children with CP. This finding may be related to the number of patients included in the study or the lack of a significant relationship between these values, as the dietary habits and issues were not indicative of malnutrition. In a study examining the anthropometry and body composition of children with CP, serum leptin and protein values, mid-upper arm and hip circumferences, and subscapular skinfold thickness were measured. In patients with more severe motor loss, the fat content of skinfold thickness and serum ferritin levels were found to be lower than those with mild involvement (24). Similarly, in our study, there were statistically significant differences between the GMFCS levels of the patients and the mid-upper arm circumference.

In conclusion, nutritional problems are frequently encountered in patients with CP. Some of these problems are directly related to the level of functional disability. Children with CP should be evaluated in terms of nutrition and malnutrition. Based on our study findings, we suggest that increasing the patients' functional gains with rehabilitation therapies will reduce their nutritional problems.

Declarations

The authors received no financial support for the research and/or authorship of this article. There is no conflict of interest.

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