Dietary Assesment of Children with Cerebral Palsy: Case Control Study in Isparta*

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Objective: **To evaluate nutrient intakes and dietary assessment of the children with cerebral palsy (CP) in our region, and to investigate the effects of various factors specific to this condition.**

Method: **Forty-three children (24 males 19 females; mean age 8.1±4.2 years) with CP admitting to an outpatient center were included in the study. In addition, a control group of 27 children were recruited from the siblings of the children with CP. All caretakers were interviewed and a three-day dietary record of the children with CP and controls were obtained.**

Results: **Overall, 32.6% of the children were quadriplegic, 44.2% diplegic and 14.0% hemiplegic. The mean percent of the Recommended Dietary Allowances for energy intake was lower in the children with CP than that in the controls ($p<0.05$), while no differences were detected between the groups according to protein, calcium, iron and vitamin C intakes. We also observed that there were differences in the amount of daily nutrients in the CP group according to some characteristic like gender and age.**

Conclusion: **These results showed that daily nutrient intakes of the children with CP in Isparta province are insufficient.**

Key words: *Cerebral palsy, children, nutritional intake, dietary assessment.*

Cerebral palsy (CP) is a persistent but not static disorder especially affecting the ability to control movement and posture. Poor growth in children with CP has been well documented in the literature (1-4). The reasons why children with CP have difficulty achieving a nutritional intake sufficient to sustain a normal rate of growth have been summarized as follows: communication difficulties that inhibit or distort requests for food; impaired expression of hunger or food preferences; lack for self-feeding skills; inability to forage; and severe degrees of oral-motor dysfunction (5,6). The feeding problems of a child with CP limit calorie intake; the diminished intake, in turn, limits the child's growth (7).

Identification of risk factors associated with under nutrition is important for the early detection and treatment of this condition, and preventing later consequences for behavior, health and growth. During the management of a child with CP, nutritional evaluation, including dietary assessment, must also be performed. Dietary assessment should include an evaluation of calorie and nutrient intake for growth stage, consistency and texture of the diet for the child's feeding skill level, and medications being used (8).

The purpose of this study was to evaluate nutritional intake and dietary assessment of the children with CP in Isparta province, and to investigate the effects of various factors to this condition.

Material and Method

Patients

Forty-three children with CP, who has been regularly admitted to Isparta Spastic Children's Center, were included in the study (June 1999). There was no child with any other chronic illnesses (e.g., cardiac, renal), or taking any medication (e.g., steroids) known to affect growth. The diagnosis of CP was based on history and neurological examination. Severity of impairment was evaluated according to the Gross Motor Function Classification System (GMFCS) (9). A control group comprising 27 age- and sex-matched healthy children, was recruited from the siblings of the children with CP. The same exclusion criteria were used for the control group as for the children with CP.

Measurements

All caretakers were interviewed and informed consents were obtained. Information on demographic characteristics and feeding disorders were gathered by using a questionnaire. Those children with tongue thrust, fluid or food loss and coughing and gagging during eating, excessive time requirement for meals and difficulty in consuming textured foods were accepted to have oromotor dysfunction (OMD; 1,2). There was no child having feeding-tubes among the children with CP.

For the estimation of daily nutrient intake, a three-day (3-d) dietary record of the children with CP and the control

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Table I. The comparison of the children with CP and control groups according to gender and age groups.

		CP	Control group
		(n=43)	(n=27)
Characteristics		n (%)	n (%)
Gender	Male	24 (55.8)	14 (51.9)
	Female	19 (44.2)	13 (48.1)
Age groups (years)	1-3	5 (11.6)	3 (11.1)
	4-6	11 (25.6)	6 (22.2)
	7-9	10 (23.3)	5 (18.5)
	10-12	9 (20.9)	6 (22.2)
	13-16	8 (18.6)	7 (25.9)

Table II. The comparison of daily nutrient intakes in the children with CP and control groups.

Nutrients[a]		CP (n=43)	Control group (n=27)[b]
Calorie	kcal, mean ± SD	1544.3 ±352.0	1730.4 ±317.1*
	percent RDA, mean ±SD	81.3 ±18.0	90.5 ±16.7*
	<80%RDA, n (%)	17 (39.5)	7 (25.9)
Protein	g, mean ±SD	49.7 ±15.4	52.1 ±14.1
	percent RDA, mean ±SD	119.2 ±49.0	115.3 ±35.4
	<80%RDA, n (%)	8 (18.6)	5 (18.5)
Calcium	mg, mean ±SD	332.2 ±143.5	361.3 ±125.8
	percent RDA, mean ±SD	59.2 ±29.3	62.7 ±26.6
	<80%RDA, n (%)	32 (74.4)	20 (74.1)
Iron	mg, mean ±SD	10.1 ±3.1	10.3 ±2.1
	percent RDA, mean ±SD	98.0 ±31.9	97.1 ±26.5
	<80%RDA, n (%)	15 (34.8)	9 (33.3)
Vitamin C	mg, mean ±SD	38.3 ±17.8	42.0 ±17.8
	percent RDA, mean ±SD	75.1 ±33.3	81.2 ±32.8
	<80%RDA, n (%)	25 (58.1)	13 (48.1)

[a]SD=Standard deviation, RDA= Recommended Dietary Allowances
*[b]numeric variables Student's t test, other variables (<80%RDA)= Chi-square test, *p<0.05*

group were obtained (2). Mean calorie, protein, iron, calcium, and vitamin C intakes for the 3-d were calculated and compared with the Recommended Dietary Allowances (RDAs, National Research Council, Washington DC, 1989) for age and sex, and then expressed as a percent of the RDA.

Measurements of weight, height, lower-leg lengths and skinfold thicknesses (triceps, biceps, suprailiac and subscapular) - only in the CP group - were performed by using the methods of Cameron (10,11). An electronic scale was used to measure weight and a Holtain skinfold caliper for skinfold thickness. Percent of body fat (BF), fat mass (FM, kg) and fat-free mass (FFM, kg) were calculated from two skinfold thicknesses (triceps and subscapular) by using the equations of Slauhter et al (12). The growth status of the study group was obtained by using anthropometric measurements evaluated in another study (13).

Statistical Analysis

Diet records were analyzed according to the standard diet tables (8,14). ANTHRO software program (Version 1.02, World Health Organization, Geneva, 1999) that uses the reference data of the National Center for Health Statistics (NCHS) was used for calculation of z scores of weight for age (WAz), height for age (HAz) and weight for height (WHz). Results were expressed as mean ± standard deviation (SD). A p value of <0.05 was considered to be statistically significant. Data were

Table III. The comparison of the ratios under 80% RDAsa of daily nutrient intakes in the children with CP according to some characteristics (%).

			Nutrients[b]				
Characteristics[a]		n	Calorie	Protein	Calcium	Iron	Vit. C
Gender	Male	24	50.0	25.5	70.8	45.8	58.3
	Female	19	26.3	10.5	78.9	21.1	57.9
Age groups	7-16	27	48.1	29.6	92.6	48.1	48.1
(years)	1-6	16	25.0	0*	43.8**	12.5	75.0
Diagnosis	QP	14	50.0	28.6	57.1	50.0	64.3
	Others	29	34.5	13.8	82.8	27.6	55.2
GMFC	I-II	23	43.5	17.4	78.3	34.8	60.9
levels	III-V	20	35.0	20.0	70.0	35.0	55.0
OMD	Yes	23	43.5	17.4	69.6	34.8	60.9
	No	20	35.0	20.0	80.0	35.0	55.0
WAz scores	<-2 SD	15	53.3	33.3	80.0	46.7	60.0
	? -2 SD	28	32.1	10.7	71.4	28.6	57.1
HAz scores	<-2 SD	13	61.5	23.1	84.6	46.2	61.5
	? -2 SD	30	30.0	16.7	70.0	30.0	56.7
Total		43	39.5	18.6	74.4	34.9	58.1

[a]RDA= Recommended Dietary Allowances, GMFC= Gross Motor Function Classification System, OMD=Oromotor dysfunction, WAz= Z scores of weight for age , HAz= z scores of height for age , SD=Standard deviation
*[b]Chi-square test, *p<0.05, **p<0.001.*

analyzed with the Statistical Package for Social Sciences Version 7.51 software. The differences of demographic features and daily nutrient intake between groups and within CP group were analyzed by Student's t and Chi-square tests.

Results

The mean age of the children with CP was 8.1±4.2 years (aged 1.2 to 15.8 years) and 55.8% of them were males. In control group, the mean age was 8.9 ± 4.5 years (aged 2.2 to 15.8 years) and 51.9 % of them were males. There were no significant differences between the groups for age and sex distribution (Table I).

According to extremity involvement, there were 14 children (32.6%) with quadriplegia (in males: 54.2%, p<0.01), 19 (44.2%) with diplegia and 6 (14.0%) with hemiplegia. Thirty-five (81.4 %) of all the children with CP were spastic. Two, three and three children of the rest were athetoid, mix, and hipothonic, respectively. The ratios of GMFCS level III and above ones and OMD+ ones were 46.5% and 53.5%, respectively. There was no significant difference between male and female children in the ratios of GMFCS level, while frequency of OMD was higher in males (75.0%, p<0.01).

As we stated above, the growth status of the CP group obtained using anthropometric measurements were evaluated in another study (13). WAz, HAz and WHz scores calculated from weight and height measurements of the children with CP via the reference data of the NCHS were -1.5±0.9, -1.6±1.3, and -0.4±1.2, respectively.

Table I shows the calculated mean calorie, protein, iron, calcium, and vitamin C intakes per day, and percentages of the RDAs of these nutrients, and the ratios of being <%80 RDAs in the children with CP and the control group. The ratio of daily intake of calorie, protein, iron, calcium, and vitamin C being under 80% of RDA were lower in the children with CP than the CG, although the differences were not significant. The mean daily calorie intake of the children with CP was calculated as 1544.3±352.0, lower than the CG (p<0.05). Also the mean percentage of the RDA for calorie intake was lower in CP group than it was in CG (81.1 ±18.0 and 90.5±16.7, respectively, p<0.05).

Table II shows the comparison of the ratios under 80% of RDA daily intakes of nutrients in the children with CP according to some characteristics. Statistical difference was observed for only protein and calcium intake according to age groups. Although there were no statistical differences it was observed that some factors contribute to the daily nutrient intake in CP group. Particularly calorie and protein intake were lower for boys, for those between 7-16 years of age, for those with quadriplegia, a GMFC level of I-II, in the presence of OMD and WAz and HAz scores lower than –2SD.

Discussion

It has been reported that children with CP have difficulty in achieving on adequate food intake. In a study including 19 spastic quadriplegic CP children aged between 3-20 years and all fed by gastrostomy tube, Fried and Pencharz (15) found that in 18 energy intake, in 16 vitamin D intake and in 11 calcium intake were below the 80% of RDAs. Likewise, we observed that daily intake of nutrients other than calcium were lower in quadriplegics. In another study performed on adult with CP, Ferrang and Johnson (16) showed that both calcium and iron intakes were lower in women.

Stallings et al (1) showed that nutritional status had a stronger effect on the linear growth of younger children with CP other than older ones. We found that daily nutrient intake was lower in 7-16 age group, when compared with younger 1-6 age group.

As shown in many studies, we observed that children with CP had significantly lower caloric intake in comparison to controls (2,4,6,17). On the other hand, one must take into consideration that the children with CP - especially with spastic quadriplegic ones- had far less resting or totally energy expenditure than that required for normal children of similar age and sex (2,16,18).

It is noteworthy that the control group that was selected among siblings of the children with CP in our study seem to have a relatively poor nutritional intake, e.g. nearly a quarter of them was using a calorie intake of less than 80% of RDA. In a recent survey, it was observed that 16% of the children under five years old were stunted (height for age z scores under -2SD) in Turkey (19). It may be suggested that undernutrition in the children is a common public health issue in Turkey.

These findings suggest that feeding disorders are more prevalent among the children with CP. In addition, it appears that daily nutrient intakes in children with CP are insufficient and it is more severe in the presence of quadriplegia, OMD, and low WAz and HAz scores.

Further study is needed to understand the relationships between feeding problems, growth, and health related quality of life. Nutrition education of parents, caregivers, and the child if possible, should be emphasized.

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