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AN INVESTIGATION OF CHARACTERISTICS RELATED TO ORAL MOTOR AND SWALLOWING DISORDERS IN CHILDREN WITH CEREBRAL PALSY: A DESCRIPTIVE STUDY

ORIGINAL ARTICLE

ABSTRACT

Purpose: Oral motor problems and swallowing disorders are common in children with cerebral palsy (CP). This study was planned to examine the oral motor and swallowing related descriptive characteristics of children with CP.

Methods: This study was carried out with 90 children with CP (39 girls and 51 boys) with a mean age of 70.35±28.39 months. Gross Motor Function Classification System (GMFCS) was used for functional motor level. The Tongue Thrust Rating Scale (TTRS) for tongue thrust severity, Karaduman Chewing Performance Scale (KCPS) for chewing performance level, Pediatric Eating Assessment Tool (PEDI-EAT-10) for dysphagia symptom severity and Drooling Severity and Frequency Scale for drooling were used.

Results: According to GMFCS, 55.6% of children were in level V. The 87.8% of the children had pathological tongue thrust. The mean PEDI-EAT-10 score was 15.42±11.41. Chewing disorders were detected in 85.6%, and drooling was detected in 87.8% of CP children. The GMFCS level, clinical type of CP, presence of open mouth, food consistency and the number of pneumonia correlated with all oral motor and swallowing assessments (p<0.05).

Conclusion: In this study, various oral motor and swallowing disorders were identified in children with CP, and a Turkish community-specific general profile of these children was obtained.

Key Words: Cerebral Palsy, Deglutition, Eating, Mastication.

SEREBRAL PALSİLİ ÇOCUKLARDA ORAL MOTOR VE YUTMA BOZUKLUKLARI İLE İLİŞKİLİ ÖZELLİKLERİN İNCELENMESİ: TANIMLAYICI BİR ÇALIŞMA

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Serebral Palsili (SP) çocuklarda oral motor problemler ve yutma bozukluğu yaygın olarak görülmektedir. Bu çalışma, SP'li çocukların oral motor ve yutma bozukluğu ile ilgili tanımlayıcı özelliklerini incelemek amacı ile planlandı.

Yöntem: Bu çalışma, yaş ortalaması 70.35±28.30 ay olan 90 SP'li çocuk (39 kız, 51 erkek) ile gerçekleştirildi. Motor fonksiyonel seviye için Kaba Motor Fonksiyon Sınıflandırma Sistemi (KMFSS) kullanıldı. Dil itme şiddetinin değerlendirilmesi için Dil İtme Derecelendirme Ölçeği (TTRS), salya problemi için Salya Şiddet ve Frekans Ölçeği, çiğneme performans seviyesi için Karaduman Çiğneme Performans Ölçeği (KCPS) ve yutma bozukluğu için Pediatrik Yeme Değerlendirme Aracı (PEDI-EAT-10) kullanıldı.

Sonuçlar: KMFSS'ye göre çocukların % 55,6'sı seviye V düzeyindeydi. Çocukların %87,8'inde patolojik dil itme refleksi vardı. Ortalama PEDI-EAT-10 skoru 15,42±11,41 idi. SP'li çocukların % 87,8'inde çiğneme bozukluğu ve % 87,8'inde salya problemi saptandı. GMFCS düzeyi, klinik SP tipi, open mouth varlığı, besin kıvamı ve pnömoni sayısı tüm oral motor ve yutma değerlendirmeleri ile korelasyon gösterdi (p<0.05).

Tartışma: Bu çalışmada SP'li çocuklarda çeşitli oral motor ve yutma bozuklukları tespit edildi ve bu çocuklar için Türk toplumuna özgü genel bir profil elde edildi.

Anahtar Kelimeler: Serebral Palsi, Deglügasyon, Yeme, Çiğneme.

INTRODUCTION

Cerebral palsy (CP) is a common childhood disorder that causes impaired sensorimotor functions, including oral motor and/or swallowing dysfunction. Oral motor problems, feeding problems, drooling, and swallowing disorders (dysphagia) are common in children with CP. The incidence of these problems is up to 90%. These problems are associated with malnutrition, dehydration, incomplete teeth, failure to provide consistency transitions following maturation, aspiration pneumonia, and death. These problems also can interrupt typical development at critical periods (1-5). Therefore, early identification of oral motor and swallowing disorders in children is critical.

Many studies focus on feeding and swallowing disorders in children with CP (6,7). In these studies, the effect of feeding, swallowing, and nutrition problems on the caregiver's quality of life were examined in children with CP. Studies have pointed out that these problems are common in children with CP, negatively affecting caregivers' quality of life. However, no study has been performed to investigate the descriptive characteristics of children with CP who have an oral motor and swallowing disorders in the Turkish population.

There are many different reasons for feeding and swallowing problems (e.g. incorrect posture, anatomical problems of the oral motor structure). Therefore, it is thought that it is essential to explain the different characteristics that may cause oral motor and swallowing disorders and examine their relationship with them. Determining these relationships will be instructive in terms of the scope of the rehabilitation program. It was aimed to obtain objective data about oral motor and swallowing problems in children with CP in the Turkish population.

METHODS

This study was conducted at Hacettepe University Faculty of Physical Therapy and Rehabilitation with the Hacettepe University Swallowing Disorders Research and Application Center's cooperation. The Non-Interventional Clinical Research Ethics Committee approved the study protocol (Approval Date: 05.12.2017 and Approval Number: GO17/860-04).

All mothers provided a written consent form to participate in the study.

Participants

Ninety children referred were included in the study, who were thought to have oral motor problems and swallowing disorders. Inclusion criteria were being an age range between 3 and 12 years, diagnosed with CP by a pediatric neurologist based on international CP criteria (8). Children not in the specified age range were excluded from the study.

Assessments

Descriptive information including age, sex, prenatal, natal, and postnatal history, sucking and feeding history from the birth of the child, feeding duration time, feeding position, first teething time, GIS problem and number of pneumonia in the last one year were obtained from the mothers and noted. Two physiotherapists made all evaluations with more than ten years of clinical experience in oral motor and swallowing disorders. During the evaluations, the presence of open mouth and high palate was also noted.

The Gross Motor Function Classification System (GMFCS), a valid and reliable 5-level system, was used to classify the severity of motor functions in children. Level I indicates "Walks without restriction," and Level V means "Children are transported in a manual wheelchair in all settings" (9-12).

The Tongue Thrust Rating Scale (TTRS), which is a valid, reliable, clinically easy to use the instrument, was used to determine tongue thrust severity in children (13). The scale defines the severity of tongue thrust in four levels, ranging from 0 to 3. Level 0 indicates 'No tongue thrust', and Level 3 indicates 'severe tongue thrust'.

Drooling Severity and Frequency Scale was used to determine the severity and frequency of drooling in children. The severity of drooling is scored between 1 to 5, and the frequency of drooling is scored between 1 to 4. Increased levels indicate more severe and more frequent drooling (14).

The Karaduman Chewing Performance Scale (KCPS), a valid and reliable instrument, was used to define children's chewing performance level. The

KCPS has five different levels between 0 to 4. Level 0 shows 'Chewing function is within functional limits', and Level 4 shows 'No biting and chewing' (15). Children were asked to bite and chew a standardized biscuit, and chewing behaviour was observed to determine the appropriate chewing performance level.

The Pediatric version of the Eating Assessment Tool-10 (PEDI-EAT-10) is a scale consisting of 10 items used to screen the severity of dysphagia symptoms. Each item is scored between 0 to 4 (0=no problem and 4=severe problem). Normative data shows that a PEDI-EAT-10 score of 4 or greater indicates a risk of swallowing disorder, and higher scores mean more severe dysphagia symptom (16).

Permissions were obtained for the scales used in the study.

Statistical Analysis

Statistical analysis was performed using IBM SPSS for Windows (version 22.0, Armonk, NY, USA). Data were given as frequency and percentages, mean or median and standard deviations (SD). Normality test was performed using Kolmogorov-Smirnov test. According to the comparison results, parametric (Pearson Correlation Analysis, Student t-Test, One-way ANOVA) and non-parametric statistics (Spearman Correlation Analysis and Chi-Square Analysis) were used to examine the relationship between descriptive data and oral motor and swallowing problems according to the comparison results. Before performing regression analysis, the normality of the data, the regression analysis assumptions, the existence of a relationship between variables, and the absence of autocorrelation between variables was examined. Dependent variables do not have a normal distribution characteristic, so linear regression could not use this study (17). Logistic regression analysis could not be performed with dependent variables such as the TTRS, Drooling Severity, Drooling frequency, and KCPS by adding them to the model are no contin-

Table 1: Descriptive Characteristics of Children with Cerebral Palsy.

Variables		CP (n=90)	
		Mean±SD	Min-Max
Age (months)		70.35±28.39	36.00-144.00
Birth (weeks)		36.18±4.84	26.00-42.00
Age of Diagnosis (months)		6.63±8.04	1.00-40.00
First Teething Time (months)		10.33±4.71	4.00-24.00
		n	%
Gender	Girl	39	43.3
	Boy	51	56.7
Type of birth	Vaginal	45	50.0
	Cesarean	45	50.0
GMFCS level	Level II	5	5.6
	Level III	26	28.8
	Level IV	9	10.0
	Level V	50	55.6
Neurological Classification	Diplegic	20	22.2
	Hemiplegic	18	20.0
	Quadriplegic	52	57.8
Clinical Type of CP	Spastic	36	40.0
	Dystonic	20	22.2
	Hypotonic	15	16.7
	Athetoid	19	21.1

CP: Cerebral Palsy, GMFCS: Gross Motor Function Classification System.

uous data or data in two categories (18). Binary logistic regression analysis was used for evaluating the relationship between categorical data and PEDI-EAT-10 score (19). A p<0.05 value was considered significant.

RESULTS

This study was completed with 90 children (39 girls and 51 boys) with CP. The descriptive characteristics are shown in Table 1. The oral motor structure and feeding characteristics of children are presented in Table 2.

Pathological tongue thrust was present in 87.8% of children. Drooling was defined in a variety of severity and frequency in 87.8% of children. A percentage of 85.6% of children with CP had chewing disorders in different severities. Only 38.9% of the children had unrestricted oral intake. The mean PEDI-EAT-10 score was 15.42±11.41 (Table 3).

Table 4 shows that the differences in oral motor and swallowing function results in terms of descriptive data of children and their relationship. There were significant relationships between GMFCS level and KCPS (χ^2=25.319, p=0.013), drool-

Table 2: Oral Motor Structure and Feeding Characteristics of Children.

Variables		CP (n=90)	
		n	**%**
Sucking	**Yes**	54	60.0
Bottle-Feeding Usage	**Yes**	68	75.6
Bottle-Feeding Usage Time	**0-12 months**	6	6.7
	13-24 months	9	10
	25-35 months	22	24.4
	36 months and over	31	34.4
Pacifier Usage		28	31.1
Pacifier Usage Time	**0-12 months**	1	1.1
	13-24 months	7	7.8
	25-35 months	9	10
	36 months and over	11	12.2
Duration of Feeding	**0-30 minute**	78	86.6
	31 minute-1 hour	12	13.3
Feeding Position	**Sitting**	51	56.7
	Semi-Supine	29	32.2
	Supine	10	11.1
Food Consistency	**Formula**	4	4.4
	Puree	52	57.8
	Soft Consistency	7	7.8
	Solid	26	28.9
	Non-Oral Feeding	1	1.1
GIS Problem	**Yes**	49	54.4
	No	41	45.6
Other Problems	**Constipation**	41	45.6
	Diarrhea	4	4.4
	Reflux	2	2.2
	Other	2	2.2
Number of Pneumonia in the Last Year	**Never**	32	35.6
	Once	37	41.1
	Two times and over	21	23.3
Open Mouth	**Yes**	74	82.2
High Palate	**Yes**	51	56.7
		Mean±SD	**Min-Max**
Solid Food Transition Time	**Months**	25.05±18.69	6.00-72.00

GIS: Gastrointestinal

ing severity (χ^2=37.909, p=0.001), and frequency (χ^2=30.082, p=0.001). Pedi-Eat-10 results differed in terms of GMFCS level (f=3.654, p=0.016). There were significant relationships between clinical type of CP and TTRS (χ^2=31.648, p=0.001), KCPS (χ^2=35.422, p=0.001), drooling severity (χ^2=24.890, p=0.015) and frequency (χ^2=18.316, p=0.032). PEDI-EAT-10 results differed in terms of clinical type of CP (f=5.621, p=0.001). There were significant relationships between the presence of high palate and TTRS (χ^2=7.841, p=0.049) and drooling frequency (χ^2=8.583, p=0.035). There were significant relationships between the presence of open mouth and TTRS (χ^2=41.456, p=0.001), KCPS (χ^2=20.649, p=0.001), drooling severity (χ^2=28.897, p=0.001) and frequency (χ^2=26.729, p=0.001). PEDI-EAT-10 results differed in terms of presence of open mouth (p=0.001). There were significant relationships between feeding position and drooling severity (χ^2=21.226, p=0.007) and frequency (χ^2=20.722, p=0.002). PEDI-EAT-10 results differed in terms of feeding position (f=4.657, p=0.012). There were significant relationships between food consistency and TTRS (χ^2=33.683, p=0.001), KCPS (χ^2=71.989, p=0.001), drooling severity (χ^2=40.029, p=0.001) and frequency (χ^2=33.414, p=0.001). PEDI-EAT-10 results differed in terms of food consistency (f=11.633, p=0.001). KCPS, drooling severity and frequency results differed in terms of age of diagnosis time (f=3.351, p=0.013, f=2.698, p=0.036, and f=5.144, p=0.003). There were significant relationships between the age of diagnosis time and PEDI-EAT-10 results (r=-0.259, p=0.014). KCPS and drooling frequency results differed in terms of bottle-feeding usage time (f=14.627, p=0.001 and f=3.426, p=0.022). KCPS and drooling severity results were differed in terms of sucking time (χ^2=18.405, p= 0.001, and f=9.734, p=0.045). There were significant relationships between number of pneumonia and TTRS (χ^2=8.754, p=0.003), KÇPS (χ^2=33.804, p=0.001), drooling severity (χ^2= 22.864, p=0.001) and frequency (χ^2=19.556, p=0.001) and PEDI-EAT-10 (rho=0.619, p=0.001).

Before performing regression analysis, the nor-

Table 3: Oral Motor and Swallowing Assessment of the Children with Cerebral Palsy.

Oral Motor and Swallowing Assessment		CP (n=90)	
		Mean±SD	**Min-Max**
PEDI-EAT-10 (0-40)		15.42±11.42	0-39.00
		n	**%**
Tongue Thrust (0-III)	Level 0	11	12.2
	Level I	14	15.6
	Level II	22	24.4
	Level III	43	47.8
Drooling Severity	Dry	11	12.2
	Mild	12	13.3
	Moderate	22	24.4
	Severe	26	29.0
	Profuse	19	21.1
Drooling Frequency	Never	11	12.2
	Occasionally	17	18.9
	Frequently	36	40.0
	Constantly	26	28.9
Karaduman Chewing Performance Scale (0-4)	Level 0	13	14.4
	Level 1	11	12.2
	Level 2	7	7.9
	Level 3	28	31.1
	Level 4	31	34.4

PEDI-EAT-10: Pediatric Eating Assessment Tool

Table 4. Differences in Oral Motor and Swallowing Function Results in Terms of Descriptive Data of Children and Their Relationships

Variables	TTRS		KCPS		Drooling Severity		Drooling Frequency		PEDI-EAT-10	
	χ²/r/rho/t/f	p	χ²/r/rho/t/f	p	χ²/r/rho/t/f	p	χ²/r/rho/t/f	p	χ²/r/rho/t/f	p
Gender	6.556ᶜ	0.087	5.485ᶜ	0.241	2.318ᶜ	0.677	4.645ᶜ	0.200	-1.242ᵠ	0.127
Type of Birth	0.529ᶜ	0.912	0.486ᶜ	0.975	5.115ᶜ	0.276	3.013ᶜ	0.390	0.570ᵠ	0.600
GMFCS Level	11.070ᶜ	0.271	25.319ᶜ	**0.013***	37.909ᶜ	**0.001***	30.082ᶜ	**0.001***	3.654ᵞ	**0.016***
Neurologic Classification	3.213ᶜ	0.782	10.756ᶜ	0.126	3.823ᶜ	0.873	3.378ᶜ	0.760	0.154ᵞ	0.857
Clinical Type of CP	31.648ᶜ	**0.001***	35.422ᶜ	**0.001***	24.890ᶜ	**0.015***	18.316ᶜ	**0.032***	5.621ᵞ	**0.001***
High Plate	7.841ᶜ	**0.049***	4.238ᶜ	0.375	2.844ᶜ	0.584	8.583ᶜ	**0.035***	-1.204ᵠ	0.232
Open Mouth	41.456ᶜ	**0.001***	20.649ᶜ	**0.001***	28.897ᶜ	**0.001***	26.729ᶜ	**0.001***	-4.047ᵠ	**0.001***
Sucking History	1.343ᶜ	0.719	6.163ᶜ	0.187	5.694ᶜ	0.223	0.539ᶜ	0.910	-0.210ᵠ	0.834
Feeding Position	10.213ᶜ	0.116	14.599ᶜ	0.067	21.226ᶜ	**0.007***	20.722ᶜ	**0.002***	4.657ᵞ	**0.012***
Feeding Duration	0.285ᶜ	0.963	3.515ᶜ	0.476	1.801ᶜ	0.722	1.410ᶜ	0.703	-1.448ᵠ	0.151
Food Consistency	33.683ᶜ	**0.001***	71.989ᶜ	**0.001***	40.029ᶜ	**0.001***	33.414ᶜ	**0.001***	11.633ᵞ	**0.001***
Birth Week	7.445ᶜ	0.059	7.770ᶜ	0.100	4.419ᶜ	0.352	4.473ᶜ	0.215	0.297ᵟ	0.100
Age of Diagnosis	1.792ᵞ	0.155	3.351ᵞ	**0.013***	2.698ᵞ	**0.036***	5.144ᵞ	**0.003***	-0.259ᵠ	**0.014***
First Teething	0.592ᵞ	0.622	0.493ᵞ	0.741	1.002ᵞ	0.411	0.276ᵞ	0.842	-0.003ᵠ	0.976
Bottle Feeding Usage Time	2.306ᵞ	0.085	14.627ᵞ	**0.001***	0.929ᵞ	0.453	3.426ᵞ	**0.022***	0.502ᵠ	**0.001***
Pacifier Usage Time	5.643ᶜ	0.130	8.565ᶜ	0.073	3.254ᵞ	0.516	3.870ᶜ	0.276	-0.305ᵟ	0.115
Sucking Time	5.765ᶜ	0.124	18.405ᶜ	**0.001***	9.734ᵞ	**0.045***	5.735ᶜ	0.125	-0.044ᵟ	0.751
Solid Food Transition Time	1.796ᵞ	0.165	0.449ᵞ	0.773	0.613ᵞ	0.656	0.624ᵞ	0.604	0.026ᵠ	0.873
Number of Pneumonia	8.754ᶜ	**0.033***	33.804ᶜ	**0.001***	22.864ᶜ	**0.001***	19.556ᶜ	**0.001***	0.619ᵟ	**0.001***

*p<0.05. ᵠPearson Correlation Analysis, ᵟSpearman Correlation Analysis, ᵠStudent t-Test, ᵞOne-way Anova, ᶜChi-Square Analysis.

TTRS: Tongue Thrust Rating Scale, KCPS: Karaduman Chewing Performance Scale, Pedi-Eat-10: Pediatric Eating Assessment Tool

mality of the data, the regression analysis assumptions, the existence of a relationship between variables, and the absence of autocorrelation between variables was examined. Distribution of data included in the model within the scope was a normal distribution. Results derived from the Logistic Regression for Probability of PEDI-EAT-10 score was presented in Table 5. It was not found a significant difference between the children's characteristic which are gender, type of birth, have a high plate, bottle usage, sucking and have GIS problem and their PEDI-EAT-10 scores (p>0.05). There was a significant difference between the children's open mouth status and PEDI-EAT-10 scores (p<0.05). Children who have open mouth situation had 1.15 point more PEDI-EAT-10 scores than other children.

DISCUSSION

The study results showed that children with CP have a wide variety of oral motor and swallowing disorders. This finding underlines the significance

of evaluating oral motor and swallowing function in children with CP.

The study determined that the first teething time of children was approximately 10 months, which indicates the presence of delayed teething in our study population. It might be due to both children not being fed in an appropriate position and using a bottle feeding for a long time. Mothers of children with neurodevelopmental problems spend an average of 3.5-7.5 hours per day to feed their children (20,21). In our study, the feeding periods with appropriate positioning aid were completed between 0 and 30 minutes in 86.6% of the children despite multiple barriers. It may indicate that children are fed in improper positions, inconsistency with a viscosity (especially continue to pureed feeding), and the child is fed with verbal commands without being actively involved in the feeding process. Among the children included in the study, the most common GIS problem was constipation. When children GMFCS levels are also considered;

Table 5. Results Derived from the Logistic Regression for Probability of PEDI-EAT-10.

Variables	B	SE	Wald	df	p	Exp(B)	95% CI	
							Lower	Upper
Gender (female)	0.024	0.019	1.530	1	0.216	1.024	0.986	1.064
Type of Birth (vaginal)	-0.011	0.019	0.330	1	0.565	0.989	0.954	1.026
High plate (yes)	0.023	0.019	1.441	1	0.230	1.023	0.023	0.019
Open mouth (yes)	0.143	0.043	11.241	1	**0.001***	1.154	0.143	0.043
Bottle usage (yes)	-0.033	0.022	2.276	1	0.131	0.968	-0.033	0.022
Pacifier Usage (yes)	0.021	0.020	1.084	1	0.298	1.021	0.021	0.020
Sucking history (yes)	0.004	0.019	.045	1	0.832	1.004	0.004	0.019
GIS problem (yes)	0.033	0.020	2.825	1	0.093	1.033	0.033	0.020

*p<0.05. ß: Regression coefficient; SE: Coefficients standardized error; df: Degree of freedom; β:Unstandardized coefficients; CI: Confidence interval.

inactivity, decreased mobility, spasticity, inability to experience different nutrients, especially fibrous nutrients, and inadequacies in chewing and swallowing functions, it is thought that this condition is related to such factors. Increasing the activity level, improving mobilization, planning interventions to reduce spasticity, raising the awareness of families about nutrient content and making early interventions for oral-motor problems are very important in reducing or preventing GIS problems in these children.

Half of the children had high palate, more than half had an open mouth and pathological tongue thrust according to the oral motor assessment. Persistent pathological tongue thrust leads to the mouth opening, making the child vulnerable to infections, negatively affecting the saliva control, and chewing and swallowing dysfunction (22). In children with CP, sucking and swallowing problems are common in the first year of life (38-57%). The literature stated that nutritional problems were determined before the CP diagnosis in 60% of children (23). In our study, postnatal suction history was not identified in 40% of the children. Poor or absent sucking in newborns may be a temporary adaptation problem or the first sign of a critical disease. Therefore, obtaining neonatal sucking history is vital for the early detection of children in a risk group.

Only 28.9% of children in our study could achieve solid food intake, and the transition time to solid food intake was about two years old. It has been reported that habituating children from chewing early positively impacts their jaw and tooth de-

velopment (24). Considering the delayed teething time and GIS problems of children in our study; the prolongation of the transition to solid food and feeding with the same consistency plays an active role in developing oral motor and GIS problems.

The PEDI-EAT-10 was used to screen swallowing symptom severity, and it has been used in healthy children with a diagnosis of CP (16). The scores of the children with CP were higher than normal values, and this result suggested that swallowing safety of these children should be evaluated with an advanced clinical or instrumental swallowing assessment. Early evaluation of swallowing function and the determination of related problems would guide the early evaluation of possible neurological problems.

In this study, there were many factors between the child's feeding history and oral motor and swallowing assessment scales. Clinical Type of CP, GMFCS level, bottle feeding usage time, food consistency, and pneumonia frequency was correlated with all oral motor and swallowing assessments. The decrease in the GMFCS functional levels of children was a factor that increased the problems of chewing and drooling, and also posed a risk for dysphagia. This condition was most common in children with GMFCS level V. Children with spastic type CP had a generally severe TTRS, had severe drooling problems and had a higher risk of dysphagia. It was determined that athetoid children had more severe chewing problems compared to the other groups. Children with a high palate often had severe TTRS and drooling problems. Children with open mouth

had severe TTRS and chewing problems. Children with open mouth were found to have severe drooling problems, and these children had a higher risk of dysphagia.

The saliva frequency of the children in the sitting position was higher than the other feeding positions. It was determined that children who were fed supine had the highest risk for dysphagia. It was determined that children fed with food, puree and soft consistency had higher TTRS severity than children fed with solids and had more severe drooling problems. Similarly, children who could eat solid foods had better chewing performance and had a lower risk of dysphagia. Children who used bottles for longer had better chewing performance and had fewer drooling problems. In addition, these children had less risk of dysphagia. It was determined that children with longer sucking times had a worse chewing performance. It was determined that increased pneumonia level was a risk factor for all oral motor skills and swallowing disorder.

Oral motor function is associated with head and trunk stability. In general, as the functional level deteriorates, oral motor functions are negatively affected, and there is evidence in the literature that oral motor disorders are associated with the functional level (25). This study's findings support the literature and draw attention to the relationship between functional level and oral motor and swallowing problems. In the study, oral motor and swallowing problems are more common in spastic type cerebral palsy. This situation is due to the general characteristics (hypertonic musculature, involuntary movements, chewing and swallowing problems due to stiff facial muscles, delayed jaw movements (26). Presence of an open mouth was found to be associated with all oral motor and swallowing evaluations. The tonus and muscular imbalance of the oral structures could leave the lips in an open position. It may result in inadequacy or loss during food manipulation. The study has also drawn attention to the negative effect of long-term bottle feeding on oral motor function. Nutritive and nonnutritive sucking habits (bottle-feeding or pacifier feeding usage), are associated with an atypical swallowing pattern, for example, pathological tongue thrust. The tongue's continuous anterior-posterior motion during bottle-feeding usage may cause it to take

longer than average tongue-thrust reflex (27,28). In this study, 23.3% of the children had a history of lung infection two or more times in one year. Recurrent lung infection could be an indicator of aspiration (29). A history of lung infection was also associated with all oral motor and swallowing assessments in this study. The incidence and frequency of lung infections may be the only indication that aspiration occurs (30). It is a significant and remarkable finding. It draws attention to the importance of using these scales as a pre-screening tool for the risk of dysphagia in practice.

This study pointed out many aspects of oral motor and swallowing disorders while also providing information about children's general profile with CP in Turkey. Oral motor and swallowing problems are common in children with CP. Prolonged feeding or swallowing difficulty in premature babies may represent an early marked of undiagnosed brain injury (3,4). Therefore, early identification of oral motor and swallowing disorders in children is critical.

Instrumental assessment methods such as video fluoroscopy (VFSS) are not available in every institution to evaluate feeding and swallowing disorders. Moreover, a multidisciplinary team and equipment are required for the implementation of these methods. These applications also take a long time, and it is not always possible to apply them in practice. In this context, it is crucial to increase clinicians' awareness about using the evaluation tools (TTRS, KCPS, PEDI-EAT-10, and Drooling Severity and Frequency Scale) in the evaluation and identification of feeding and swallowing disorders.

The lack of instrumental evaluation methods in the study could be considered as a limitation. The VFSS is the gold standard in swallowing assessment. However, the use of radioactive material during evaluation is a disadvantage. Similarly, the Fiber-optic Endoscopic Swallowing study is an instrumental assessment that provides objective data on swallowing function. The method's disadvantages are that the pediatric group cannot tolerate this application and does not provide sufficient information about the application's oral phase. Despite all their disadvantages, instrumental evaluations provide reliable data in the assessment of swallowing. Instrumental evaluations do not provide

sufficient information about chewing function and tongue thrust. In this study, evaluation scales were explicitly used for chewing function, and tongue thrust was used. It could be considered a strength of the study. Although there are many studies in the literature investigating oral motor problems and swallowing problems, including children with CP, it is noteworthy that studies on tongue thrust are inadequate. A valid and reliable assessment tool specific to tongue thrust developed in our country was used in this study. It is thought that the results obtained will guide the studies on the subject in other countries. The second strength is that it is the first study conducted in this context in Turkey in this context.

In this study, we found that GMFCS level, clinical type of CP, presence of open mouth, food consistency and the number of pneumonia correlated with tongue thrust, chewing performance, drooling and dysphagia. Oral motor problems and swallowing problems should be observed in children with CP from the early period, and individuals should be included in the rehabilitation program at the earliest stage. Considering that oral motor problems and swallowing disorders are vital; it is also essential to increase experts' awareness and work in pediatric rehabilitation on this issue.

Conflict of Interest: There is no conflict of interest.

Ethical Approval: The study's ethical approval was gathered from the Noninvasive Clinical Research Ethics Committee approved the study protocol (Approval Date 05.12.2017 and Approval Number: GO 17/860-04).

Informed Consent: Written informed consent was obtained from all children and their parents.

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