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Relationship between nutritional status, dysphagia, and functional eating level in adult patients with cerebral palsy in long institutional stays

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HIGLIGHTS

- Diets with modified consistencies may cause malnutrition.
- Patients with dysphagia in long term health institutions should ingest the prescribed amount of food to avoid malnutrition.
- In patients with cerebral palsy with more intense dysphagia and greater eat restrictions are associated with the worse nutritional status.
- The nutritional status of patients with cerebral palsy and dysphagia do not always worsen between assessments with 12-month interval.

ABSTRACT – Background – Diets with modified consistencies for patients with dysphagia in long term care health institutions may be associated with malnutrition. **Objective** – To assess the nutritional status of adult patients with cerebral palsy and dysphagia hospitalized in a health institution for more than 10 years. **Methods** – This prospective investigation was performed in 56 patients with cerebral palsy (ages 25 to 71 years, mean: 44±12 years) and no other neurological diagnosis in hospital stay for more than 10 years had their nutritional status, dysphagia, and food ingestion capacity assessed in two moments with a 12-month interval in between them, respectively using the body mass index, the dysphagia risk assessment protocol (PARD), and the functional oral ingestion scale (FOIS). **Results** – There were no differences between December 2015 and December 2016 in the patients' weight, nutritional status, diet consistency classification, PARD, and FOIS. The limits of prescribed diet consistency (IDDSI-FDS) and the assessments of dysphagia and functional eating level influenced the nutritional status. More intense dysphagia and greater eating restrictions were associated with a worse nutritional status. **Conclusion** – The nutritional status of adult patients with cerebral palsy hospitalized in a health long term institution who had modified diets according to their swallowing and mastication capacity did not worsen between assessments with a 12-month interval in between them. The severity of dysphagia and diet restrictions interfere with the patients' nutritional status – dysphagia and more intense eating restrictions are associated with a worse nutritional status.

Keywords – Malnutrition; deglutition disorders; cerebral palsy, hospitalization.

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INTRODUCTION

Cerebral palsy (CP) is a diagnosis that encompasses a set of permanent changes that affect movements, muscle tone, posture, perception, sensations, cognition, communication, and behavior[1]. This condition results from interrupted oxygen supply, leading to a hypoxia/ischemia process, which combined with other factors cause cerebral lesion and limitations to development[2].

Patients with CP from birth are frequently affected with dysphagia, which is perceived in the first weeks of life[3], impairing their quality of life and survival. Some of them survive into adulthood, despite limitations to ingesting food[4,5], as well as other limitations and complications from the disease.

Adult patients with CP may need daily care, sometimes living in long term care institutions for a long time. Those who can maintain oral feeding may need adjustments in food consistencies to ensure safe and effective eating. However, changes in the diet of patients in long institutional stays are associated with malnutrition, muscle mass loss, and dehydration[6-8].

The objectives of this investigation were to: a) learn the limits of modified diets ingested by adult patients with CP in long institutional stays, based on the classification of the International Dysphagia Diet Standardisation Initiative – Functional Diet Scale (IDDSI-FDS)[9]; b) assess changes in the patients' nutritional status over 12 months, whose diets had the indicated consistencies according to their limitations; c) assess the relationship between nutritional status, dysphagia, functional eating level, and gross motor function classification. The hypothesis was that long institutional stays combined with limitations from the disease are associated with malnutrition (which may progress over 12 months even when the patients' diets have an adequate consistency to their condition) and that there is a relationship between the nutritional status, dysphagia, functional eating level, and gross motor function classification.

METHODS

This study was conducted in adult patients diagnosed with CP and dysphagia, institutionalized in the neurological rehabilitation center at the Regional Hospital of Divinolândia, São Paulo, Brazil. This is a prospective cohort study in which all participants were assessed twice in December 2015 and December 2016. No patient had any other neurological diagnosis. The investigation was approved by the Research Ethics Committee of the Medical School of Ribeirão Preto (USP), protocol number 7274/2016, and by the board of directors of the Regional Hospital of Divinolândia. The identities of patients, caregivers, and relatives were kept confidential.

Patients motor function were classified with the gross motor function classification system (GMFCS)[10,11], swallowing was assessed by using the speech-language-hearing dysphagia risk assessment protocol (PARD, in Portuguese)[12], and the functional oral ingestion scale (FOIS)[13,14]. GMFCS divides patients with CP into levels 1 (walks with no difficulties but some restrictions) through 7 (very limited mobility, even with the use of technological assistance). PARD results range from level 1 (normal swallowing) to 7 (severe oropharyngeal dysphagia), and FOIS results range from level 1 (no oral feeding) to 7 (totally oral diet, with no restrictions).

The nutritional status was assessed by calculating the body mass index (BMI), defined by the World Health Organization[15], and with the method for people above 60 years old[16]. BMI is calculated with the person's weight and height[15,16]. The body height of patients with CP was calculated with a validated method that measures knee height[17]. Based on their BMI, patients were classified as malnourished, normal, overweight, or obese. The classification for people up to 60 years old is BMI (kg/m^2) below 18.4 – malnourished; 18.5 to 24.9 – normal; 25.0 to 29.9 – overweight; ≥30 – obese. For those 60 years or older, the classification is BMI below 21.9 – malnourished; 22.0 to 26.9 – normal; 27.0 to 30.0 – overweight; ≥30 – obese.

The patients' diets had liquid and food consistencies defined for them by the hospital dysphagia treatment team, named in according to the International Dysphagia Diet Standardisation Initiative – IDDSI[18]. The limits of these consistencies were evaluated with the IDDSI-FDS[9].

Continuos data were analyzed by the Wilcoxon and McNemar tests. Categorical data were analyzed

by Fisher's exact test. A non-parametric test was performed when appropriate. Continuos data were presented as mean, standard deviation, and median, and categorical data as absolute frequency. Results with $P<0.05$ were considered statistically significant.

RESULTS

The study assessed all adults patients with CP and dysphagia at the institution. They were 56 patients institutionalized for more than 10 years – 27 men (48%) and 29 women (52%), aged 25 to 71 years, mean of 44 (12) years in December 2015. All patients received oral feeding, with restrictions and consistencies defined by hospital professionals who cared for the patients, and diets prepared by the nutrition service. Six patients also received enteral diets via nasoenteral tubes.

The patients' mean weight in December 2015 was 51.9 (16.8) kg, with a median of 47 kg, ranging from 28.6 kg to 113.0 kg. In December 2016, the same patients weighed 51.7 (16.0) kg, with a median of 48 kg, ranging from 29.3 kg to 110.0 kg – which indicates no difference between the two assessment moments ($P=0.13$). There was no difference in nutritional status between 2015 and 2016 (TABLE 1, $P=0.22$). In general, the limits of the patients' modified diets IDDSI-FDS were not different between 2015 and 2016 (TABLE 2, $P=0.40$).

The limits of each patient's diet consistency were

TABLE 1. Nutritional status of 56 adult patients with cerebral palsy assessed in December 2015 and December 2016.

Nutritional Status	2015		2016	
	N	%	N	%
Malnourished	17	30.4	11	19.7
Normal	26	46.4	32	57.1
Overweight	6	10.7	8	14.3
Obese	7	12.5	5	8.9
TOTAL	56	100	56	100

McNemar test N: number $P=0.22$.

TABLE 2. Relationship between classification in the IDDSI – Functional Diet Scale (IDDSI-FDS) in 2015 and 2016 in 56 adult patients with cerebral palsy.

IDDSI-FDS	2015		2016	
	N	%	N	%
1	2	3.6	4	7.1
2	0	0	0	0
3	0	0	8	14.3
4	2	3.6	4	7.1
5	13	23.2	10	17.9
6	19	33.9	19	33.9
7	8	14.3	6	10.7
8	12	21.4	5	9.0
TOTAL	56	100	56	100

McNemar test N: number $P=0.40$.

related to the nutritional status (P=0.04) – the less restrictive the consistency, the better the nutritional status (TABLE 3).

Also, the assessments of dysphagia (P=0.03) and functional eating level (P=0.01) were related to the nutritional status (TABLE 4) – the more severe the dysphagia and the worse the functional level of eating, the worse the nutritional status. The same could be said of the comparison between GMFCS and the nutritional status, although it did not reach statistical significance (TABLE 4, P=0.07).

Patients with more intense dysphagia according to PARD had more food consistency restrictions (TABLE 5, P=0.01).

There were no differences in FOIS and PARD measures between December 2015 and December 2016 (P>0.05). Hence, the 2015 results were presented.

DISCUSSION

No significant change was found in the patients' nutritional status between the assessments made in

TABLE 3. Relationship between classification in the IDDSI – Functional Diet Scale (IDDSI-FDS) and the nutritional status in 56 adult patients with cerebral palsy.

Nutritional Status	Malnourished		Normal		Overweight		Obese	
IDDSI-FDS	N	%	N	%	N	%	N	%
1	1	5.9	1	3.8	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	1	5.9	1	3.8	0	0	0	0
5	6	35.3	7	26.9	0	0	0	0
6	6	35.3	9	34.7	4	66.6	0	0
7	2	11.7	4	15.4	1	16.7	1	14.3
8	1	5.9	4	15.4	1	16.7	6	85.7
TOTAL	17	100	26	100	6	100	7	100

Fisher exact test N: number P=0.04.

TABLE 4. Relationship between the dysphagia risk assessment protocol PARD, the FOIS, the GMFCS, and the nutritional status BMI of 56 adult patients with cerebral palsy.

Nutritional Status	Malnourished		Normal		Overweight		Obese	
	N	%	N	%	N	%	N	%
PARD								
1–2	2	11.8	2	7.7	1	16.7	5	71.4
3–4	10	58.8	15	57.7	4	66.6	0	0
5–6	4	23.5	8	30.8	1	16.7	2	28.6
7	1	5.9	1	3.8	0	0	0	0
FOIS								
4	2	11.8	1	3.8	0	0	0	0
5	12	70.6	17	65.4	4	66.6	0	0
6	2	11.8	4	15.4	1	16.7	1	14.3
7	1	5.8	4	15.4	1	16.7	6	85.7
GMFC								
III	0	0	1	3.8	0	0	2	28.6
IV	8	47.1	12	46.2	3	50.0	5	71.4
V	9	52.9	13	50.0	3	50.0	0	0
TOTAL	17	100	26	100	6	100	7	100

FOIS: functional oral ingestion scale; GMFC: gross motor function classification system; BMI: body mass index.
Fisher exact test, PARD: P=0.03; FOIS: P=0.01; GMFC; P=0.07.

TABLE 5. Relationship between the IDDSI – Functional Diet Scale (IDDSI-FDS) and the dysphagia risk assessment protocol (PARD) in 56 adult patients with cerebral palsy.

PARD	1–2		3–4		5–6		7	
IDDSI-FDS	N	%	N	%	N	%	N	%
1	0	0	0	0	1	11.1	1	100
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	1	12.5	0	0	0	0	0	0
5	0	0	2	18.2	2	22.2	0	0
6	0	0	6	54.5	2	22.2	0	0
7	0	0	3	27.3	3	33.4	0	0
8	7	87.5	0	0	1	11.1	0	0
TOTAL	8	100	11	100	9	100	1	100

IDDSI-FDS: International Dysphagia Diet Standardisation Initiative – Functional Diet Scale.
Fisher exact test N: number *P*=0.01.

December 2015 and December 2016. Dysphagia assessment and food ingestion capacity were related to nutritional status impairment.

The relationship between greater difficulties to ingest food and nutritional status impairment was demonstrated in children with CP[19]. More severe dysphagia makes ingestion difficult regarding the composition and quantity of foods necessary to maintain an adequate nutritional status. Dysphagia assessment results are determining factors when deciding what diet is permitted to each patient. IDDSI-FDS[9] was developed to complement the IDDSI food consistency classification[18]; it results from restrictions indicated to each dysphagic patient by the professionals who treat them. It does not establish specific consistencies for each patient, but the limits in their diet consistencies related to the severity of dysphagia. In the IDDSI-FDS classification, lower numbers indicate greater diet consistency restrictions[9].

It is possible to find adequate diets for patients with oral ingestion capacity and control their ingestion, despite limitations caused by the disease, which is done in the institution where patients were hospitalized. Nonetheless, 30% of patients were underweight. The ingestion of the diet prescribed for these patients is not often followed[20]; therefore, it must be more rigorously surveilled. There may be deficiencies related to micronutrients, as observed in children[21], which must be assessed to avoid complications.

Even though no differences were found in the nutritional status between 2015 and 2016, the analysis of patients per group showed that the number of malnourished subjects decreased from 17 to 11, and that of obese individuals decreased from 7 to 5. This suggests that the nutritional status of some of them was adjusted, indicating that a more attentive follow-up of prescribed diet ingestion can improve the nutritional status – a possibility that has been suggested in previous studies[22,23].

Nutritional status impairment in patients with dysphagia due to inadequate ingestion of modified diets[6,7,22,23] may be caused by discomfort during meals[23] and diminished appetite to ingest foods[24], especially because of appearance, consequently decreasing the amount of ingested food[25]. These deficiencies in long institutionalizations can impair the nutritional status. Adjustments in food presentation and preparation may have an important role in better acceptance of diets, as there have been positive results[22,23]. Deciding on a diet prescription and following it with each patient are important because when ingestion capacities are exceeded, aspiration pneumonia is more likely to occur[26].

Diet consistency modifications are not the only factor that causes malnutrition. The importance of dysphagia in patients' overall status is directly related to difficulties in feeding. Another factor that may affect nutrition is the impaired neural control of the digestive system, which may change the motor, secretion, and absorption functions[27-29]. These patients often have gastroesophageal reflux disease[30,31], which can also cause dysphagia[32,33] and affect food ingestion.

The benefits of a modified diet to prevent aspiration in patients with oropharyngeal dysphagia have not been fully clarified yet and may not be the expected ones[34]. Nevertheless, its prescription is grounded on what is already known about swallowing in neurological patients. Further evidence is needed to better understand its benefits.

This investigation has limitations. Food ingestion was not quantified, complications during the one year between evaluations was not controlled, and it was not possible to assess meal acceptance, given the patients' limitations. The nutritional status was assessed only with BMI. The time between the two assessments (1 year) may not have been enough to demonstrate a worsened nutritional status. Swallowing was not assessed with more precise methods, such as videofluoroscopy or nasal endoscopy, because of the patients' limitations and the unavailability of radiologic and/or endoscopic equipment to perform examinations. Even with these limitations the results are important. Professional care and assistance to dysphagic patients may prevent malnutrition.

In conclusion, the nutritional status did not worsen in this group of adult patients with CP assessed with a 12-month interval, whose diet had restrictions according to their swallowing ability. The severity of dysphagia and diet restrictions interfere with the nutritional status of adult patients with CP.

Authors' contribution

Oliveira L, Marquitti FD, Ramos SCH and Almeida EA participated in study conceptualization, data collection, discussion of results, manuscript preparation, and the decision to submit the manuscript for publication. Nascimento WV and Dantas RO participated in study conceptualization, discussion of results, manuscript preparation, and the decision to submit the manuscript for publication.

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Oliveira L, Marquitti FD, Ramos SCH, Almeida EA, Nascimento WV, Dantas RO. Relação entre estado nutricional, disfagia, e nível funcional de alimentação em pacientes adultos com paralisia cerebral em instituição de longa permanência. Arq Gastroenterol. 2023;60(2):194-200.

RESUMO – Contexto – Dieta com consistência modificada para pacientes com disfagia internados em instituições por longa permanência pode causar desnutrição. **Objetivo** – Avaliar o estado nutricional de pacientes adultos com paralisia cerebral (PC) e disfagia internados em instituição de saúde por mais de dez anos. **Métodos** – É um estudo prospectivo realizado em 56 pacientes com PC com idades entre 25 e 71 anos, média: 44±12 anos. O estado nutricional, a disfagia e a capacidade de ingestão alimentar foram avaliados em dois momentos, separados por 12 meses, respectivamente pelo índice de massa corporal (IMC), protocolo de avaliação do risco de disfagia (PARD) e pela escala funcional de ingestão por via oral (FOIS), em 56 pacientes com PC internados em instituição hospitalar por mais de 10 anos, sem outro diagnóstico neurológico. **Resultados** – Não houve diferenças, entre dezembro de 2015 e dezembro de 2016, nas avaliações do peso, do estado nutricional, na classificação da consistência da dieta ingerida, na escala PARD para disfagia e na escala FOIS de avaliação de ingestão por via oral. Houve influência dos limites da consistência da dieta prescrita (IDDSI-FDS), da avaliação da disfagia e do nível funcional da alimentação no estado nutricional. Disfagia mais intensa e maior restrição alimentar foram associadas com pior estado nutricional. **Conclusão** – Em pacientes adultos com PC, avaliados com intervalo de 12 meses, não houve piora do estado nutricional. A intensidade da disfagia e as restrições alimentares são fatores que interferem no estado nutricional dos pacientes, disfagia e restrições alimentares mais intensas associadas com pior estado nutricional.

Palavras-chave – Desnutrição; transtornos de deglutição; hospitalização; paralisia cerebral.

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