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Nutritional status and quality indicators for enteral nutritional therapy in institutionalized patients with cerebral palsy

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Abstract

This study aimed to describe the nutritional status (NS) of institutionalized patients with cerebral palsy receiving enteral nutrition therapy (ENT) and apply quality indicators concerning administration of enteral nutrition (EN). Retrospective observational study. To assess NS, data on body weight, height, arm circumference (AC), triceps skinfold thickness (TSF), muscle circumference spleen (MCS) and body mass index (BMI) were collected from the individuals' medical records. Six quality indicators were monitored: (1) frequency of BMI measurement in patients with nutritional therapy (NT); (2) frequency measurement or estimation of energy expenditure and protein needs of patients in NT; (3) frequency of days of adequate fluid administration in patients in NT; (4) frequency of days of proper management of energy in patients in NT; (5) frequency of days of proper administration of protein in patients with NT; and (6) frequency of complications related to the administration of EN. Eight individuals were assessed. The mean BMI was 18.65 ± 3.2 kg / m²; %AC was 85.63% ± 6.05%; MCS was 85.13% ± 15.27%; and TSF was 116.5% ± 76.6%. Regarding indicators 4 and 6, it was found (ou observed) 25% of adequacy, and 5 showed 75% of adequacy. The other indicators showed 100% compliance. The patients presented depletion of muscle tissue and fat reserve, despite low weight. Indicators 4, 5 and 6 presented low percentage of adequacy, reflecting the importance of their monitoring.

Key words: Cerebral Palsy. Nutritional Status. Quality Indicators. Enteral Nutrition.

Introduction

Cerebral palsy (CP) refers to a group of permanent disorders that affect movement and posture, causing limitations in the individuals' activities. Such disorders are non-progressive brain damages that appear during the fetal brain development or early childhood.[1]

CP has important effects on the function and quality of life of individuals and family.[2] CP motor disorders are frequently accompanied by sensation, communication, behavior impairments and convulsions.[1]

CP is the most common cause of childhood disability, accounting for 2-2.8/1000 of live births[3] and can reach seven children per thousand of live births in underdeveloped countries.[4] The high numbers found in underdeveloped countries suggest that the care provided to pregnant women and newborns in many regions is critically poor.[2]

Individuals with CP may have gastrointestinal disorders and difficulties to eat, with direct effects on their nutritional status and quality of life, once the neurological connection with the digestive tract is very important.[5,6] Among the difficulties most commonly found, we could cite dysphagia to solids and liquids, regurgitation, vomiting, longer time to eat the meal and intestinal constipation.[6-8]

Enteral nutrition therapy (ENT) appears as a therapeutic possibility for maintenance or recovery of the nutritional status of individuals that have intact gastrointestinal tract but with partial or entirely impaired oral ingestion. Thus, enteral nutrition (EN) aims at offering all nutrients that are needed for the maintenance of life, cellular and tissue growth, minimizing and/or reverting the impact of malnutrition.[9]

Early ENT can be a key factor in promoting health, reducing physiological stress and keeping the immune system strong.[10] Thus, the choice and prescription of EN is complex and requires clinical and nutritional knowledge. Moreover, so important as to prescribe appropriate ENT to meet the patient's needs is to make sure that the patient will actually receive the volume prescribed.[8] Insufficient intake of nutrients becomes even more critical in case of malnutrition.[11-13]

Proper energy supply to patients with CP is necessary for the restoration of the nutritional status. However, there is often an undersupply of this nutrient in relation to the nutritional estimates. Various factors interfere on the actual supply, among them intolerance to diet and interruption of the tube feeding administration for procedures.[14]

In this context, daily monitoring of nutritional supply is vital, because it allows strategies to be set to increase the efficiency of the nutritional therapy and, consequently, an improved quality of the nutritional care.[15] As a result, quality indicators are applied by the institutions to ensure efficient daily routines, costs reduction, better processes analysis and, especially, better clinical outcomes and an improved quality of life of the individual.

Thus, the aim of this study was to describe the nutritional status of institutionalized patients with CP receiving ENT and apply quality indicators for the administration of enteral feeding.

Methodology

Retrospective observational study conducted with adult patients with diagnosis of CP, receiving enteral nutrition and institutionalized in a public institution in Curitiba-PR, Brazil. The Ethics Research Committee of the "Campos de Andrade" University Center approved the study under process no. 817.867. Data were collected in September 2014, after the institution's manager had signed the Free Informed Consent Form.

All patients receiving ENT exclusively for at least 72 hours, minimum age of 20 years, of both sexes were included in the research. For the patients' identification, the following information were obtained from the medical record: name, gender and birth date. The clinical data collected were medical diagnosis, presence of comorbidities and biochemical tests for hemoglobin, albumin, total cholesterol, triglycerides and glucose. The biochemical test values were compared with Verrastro.[16]

Nutritional status assessment

To assess the nutritional status, the following data were collected from the patient's medical records: actual or estimated weight, actual or estimated length, mid-upper arm circumference (MUAC), triceps skinfold thickness (TST), arm muscle circumference (AMC). The classification of the nutritional status of MUAC, TST and AMC was made according to Blackburn & Thornton.[17] The BMI was classified according to WHO[18] for adults (20 to 59 years old).

Quality indicators of nutritional therapy

Comparison between programmed and administered diets of enteral nutrition

The adequacy of programmed and administered enteral diet was assessed for calories, carbohydrates, proteins, dietary fibers, liquid consumption and adequacy of total energy value (TEV).

Frequency of BMI measurement in patients receiving enteral nutrition

This indicator was assessed considering the number of patients receiving NT with the calculated BMI value, divided by the total number of NT patients, multiplied by 100. The information was collected from the patients' medical records. The target value set for the indicator was 80%.[19]

Frequency of measurement or estimation of energy expenditure and protein needs in patients receiving enteral nutrition

This indicator was measured according to the number of patients receiving NT who were assessed for energy and protein expenditures divided by the total number of patients, multiplied by 100. The data were collected from the patients' medical records. The target value set for the indicator was 80%.[19]

Frequency of days of adequate calorie administration in patients receiving nutritional therapy

This indicator was calculated according to the number of days with energy intake lower than 25 kcal/kg or higher than 35 kcal/kg/day, divided by the total number of days assessed, and then multiplied by 100. The data were collected from the patients' medical records. The target value set for this indicator was 80%.[19]

Frequency of days of adequate proteins intake by patients receiving nutritional therapy

This indicator was examined considering the number of days with protein intake lower than 0.8g/kg/day or higher than 2g/kg/day, divided by the total number of days assessed and then multiplied by 100. The data were collected from the patients' medical records. The target value set for this indicator was 80%.[19]

Frequency of days of adequate liquids administration in patients receiving nutritional therapy

This indicator was calculated according to the number of days of liquid intake below 1kcal/ml, divided by the total number of assessed days and then multiplied by 100. The data were collected from the patients' medical records. The target value set for this indicator was 90%.[19]

Frequency of complications related to enteral nutrition

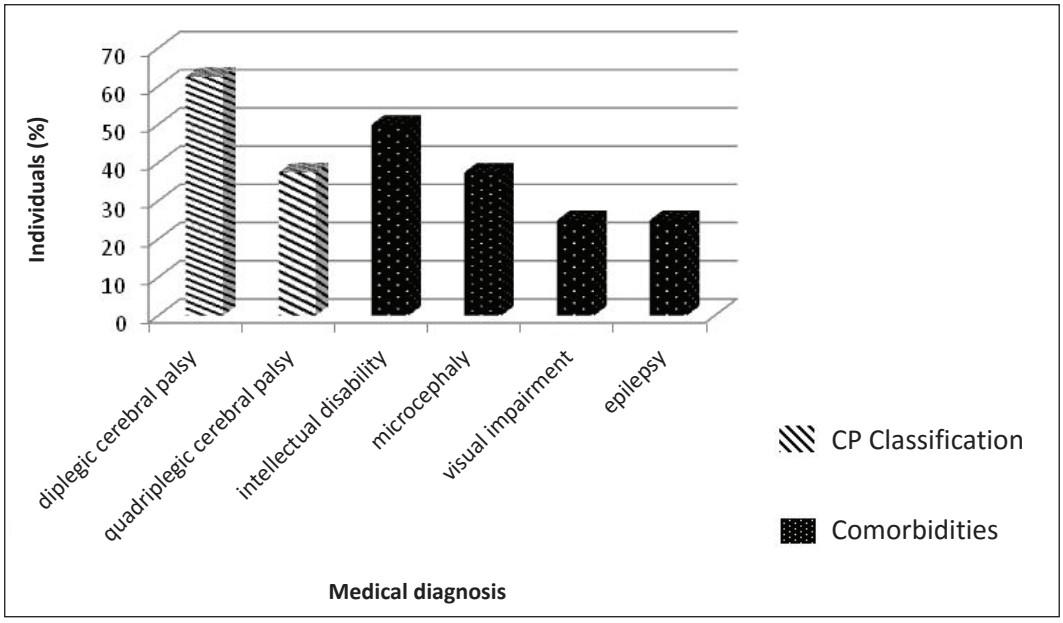
This indicator was set according to the number of patients that experienced complications such as nausea, vomiting, gastric stasis, reflux, colic, bloating, flatulence, constipation and other enteral nutrition-related disturbances, divided by the total number of patients fed by EN, multiplied by 100. The data were collected from the patients' medical records. The target value set for this indicator was 5%.[19]

Statistical analysis

The data were described by simple frequency distribution, mean and standard deviation and compiled by the Microsoft Excel® software.

Results

Of 209 inpatients, eight patients who met the inclusion criteria were included in the study, 62.5% (n=5) female and 37.5% (n=3) male, aged 29.5 ± 9.62 years old. The medical diagnosis of these patients is described in Figure 1. The majority of the patients, 67.5% (n=5), had diagnosis of diplegic cerebral palsy, and 37.5% (n=3), quadriplegic cerebral palsy. According to the CP classification, 50% (n=4) had intellectual disability; 37.5% (n=3), microcephaly; 25% (n=2), visual impairment; and 25% (n=2), epilepsy.



Legend: CP: Cerebral Palsy

Figure 1. Medical diagnosis of the assessed individuals with cerebral palsy fed by enteral nutrition, Curitiba-PR, Brazil, 2014.

A description of the nutritional status is presented in Table 1. According to these results, 62.5% (n= 5) of the individuals had BMI thinness grade 1, and 37.5% (n= 3) were eutrophic. Regarding %MUAC, 12.5% (n= 1) of the patients showed moderate malnutrition; 62.5% (n= 5), mild malnutrition; and 25% (n=2) were eutrophic. Regarding %TST, 12.5% (n=1) of the patients showed severe malnutrition; 12.5% (n= 1), moderate malnutrition; 12.5% (n= 1), mild malnutrition; 37.5% (n= 3), eutrophy; and 25% (n= 2), obesity. With regard to %AMC, 50% (n= 4) showed mild malnutrition; 25% (n= 2), severe malnutrition; and 25% (n= 2) were eutrophic.

Table 1. Mean values and standard deviation of the nutritional status assessment parameters of individuals with cerebral palsy included in the study, Curitiba-PR, Brazil, 2014.

		Mean	SD	
BMI (kg/m²)		18,65		3.29
	Thinness grade I	62.5%	(n= 5)	
	Eutrophy	37.5%	(n= 3)	
MUAC (%)		85.6%		6.05
	Moderate malnutrition	12.5%	(n= 1)	
	Mild malnutrition	62.5%	(n= 5)	
	Eutrophy	25%	(n= 2)	
TST (%)		116.5%		76.6
	Severe malnutrition	12.5%	(n= 1)	
	Moderate malnutrition	12.5%	(n= 1)	
	Mild malnutrition	12.5%	(n= 1)	
	Eutrophy	37.5%	(n= 3)	
	Obesity	25%	(n= 2)	
AMC (%)		85.13%		15.27
	Severe malnutrition	25%	(n= 2)	
	Mild malnutrition	50%	(n= 4)	
	Eutrophy	25%	(n= 2)	

Legend: BMI: Body mass index; MUAC: mid-upper arm circumference; TST: triceps skinfold thickness; AMC: arm muscle circumference

The data of Table 2 show the individuals' average clinical laboratory tests results. The tests showed that 37.5% (n=3) of the individuals had anemia, characterized by low hemoglobin levels, 25% (2=2) being male and 12.5% (n=1), female. Regarding albumin, only 12.5% (n= 1) showed hypoalbuminemia. With regard to cholesterol, 12.5% (n= 1) showed hypercholesterolemia. The tests results for triglycerides and glucose were normal.

Table 2. Clinical laboratory tests of individuals with cerebral brain assessed in the study, Curitiba, PR, Brazil, 2014.

Lab test	Mean ± DP
Hemoglobin (g/dl)	12.98 ± 1.23
Albumin (g/dl)	4.06 ± 0.47
Cholesterol (mg/dl)	157.78 ± 33.57
Triglycerides (mg/dl)	79.73 ± 30.07
Glucose (mg/dl)	80.51 ± 13.95

With regard to enteral nutrition, 100% of the patients were fed by enteral nutrition via gastrostomy. The enteral diets provided were of the polymeric type for 87.5% (n= 7) of the individuals. Only 12.5% (n=1) of the patients were fed hydrolyzed enteral diets. Table 3 compares the enteral diet's programmed values with the administered diet values and the percentage of dietary adequacy.

Table 3. Comparison between programmed and administered diet in individuals with cerebral palsy assessed in the study. Curitiba-PR, Brazil, 2014.

	Programmed	Administered	% adequacy
TEV	1493.63 ± 110.25	1490.5 ± 551.74	100.35 ± 37.52
kcal/kg/day	34.6 ± 4.32	35.15 ± 15.95	100.21 ± 37.32
Protein (g/kg/day)	1.12 ± 0.06	1.25 ± 0.44	111.97 ± 39.75
Carbohydrate (%TEV)	55.36 ± 7.49	60 ± 0	92.26 ± 12.49
Lipids (% TEV)	29.94 ± 2.11	29.44 ± 6.15	110.6 ± 27.07
Dietary fibers (g/day)	20 ± 0	14.89 ± 3.22	74.46 ± 16.09
Liquid consumption (kcal/ml)	1.48 ± 0.10	1.84 ± 0.38	124.54 ± 24.28

*Results expressed in mean values and standard deviation

Regarding enteral feeding, there was not difference between the programmed and administered TEV. Adequacies for total energy value, kcal/kg of weight/day, proteins, carbohydrates and lipids were in the range of 92.26 to 110.6%. Dietary fibers intake was below the recommended values in 74.46% ± 16.09% of the cases and liquid consumption was higher (124.54 ± 24.28%).

Regarding the indicators of frequency of the BMI measurement, the frequency of measurement or estimation of energy expenditure and protein needs and the frequency of days of adequate liquid administration to patients fed by enteral nutrition, it was found that 100% of these patients reached the target values.

With respect to the indicator of frequency of adequate energy administration in EN patients, it was found that 37.5% (n= 3) of the individuals received less than 25 kcal/kg/day, and 37.5% (n= 3), more than 35 kcal/kg/day – therefore, this indicator showed 25% of adequacy. Regarding the indicator of frequency of adequate proteins intake, it was found that 12.5% (n= 1) of the patients fed on EN received less than 0.8g/kg/day of proteins, and 12.5% (n= 1) more than 2g/kg/day – i.e., this indicator showed 75% of adequacy.

Figure 2 illustrates EN-related complications in the patients assessed. With regard to this indicator, 75% (n= 6) of the patients had some complication, the main one being constipation in 75% (n= 6) of the individuals, followed by nausea and vomiting in 12.5% (n= 1) of the patients. No other complication was found in the patients in the study period.

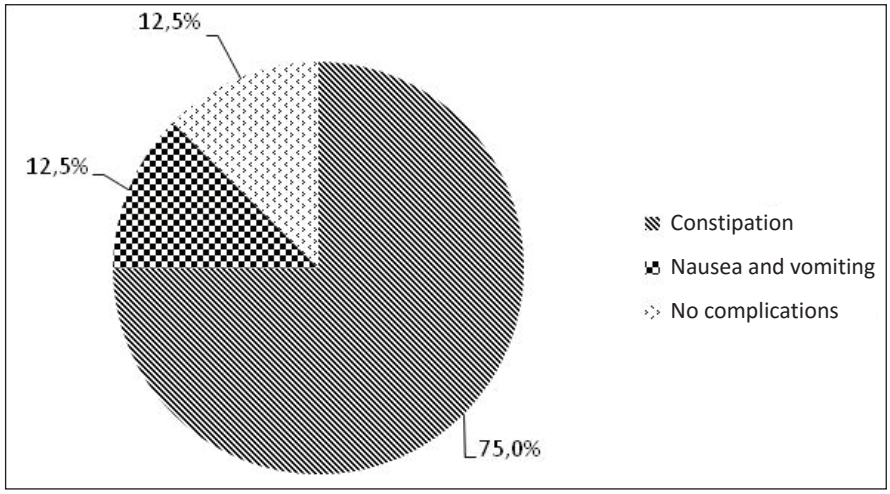


Figure 2. Enteral nutrition-related complications found in patients with cerebral palsy assessed in the study, Curitiba-PR, Brazil, 2014.

Discussion

ENT has been considered, whenever possible, as the method chosen for patients who cannot be fed orally and meet the minimum energy needs, usually increased by physiological stress.[18]

This study showed that the majority of the individuals assessed had thinness grade 1, according to the BMI. Even when properly nourished, individuals with CP are smaller than those without disabilities, probably because of physical inactivity, mechanical force on bones, joints and muscles, endocrine factors, high prematurity prevalence and low birth weight.[20,21] Few studies have assessed the nutritional status of adult individuals with cerebral palsy. The studies that were found suggest that there is a decreased linear growth, decreased weight gain and alterations in the body composition, with decreased muscle mass, fat mass and bone density. Linnea et al.[22] associate the inadequate nutritional status as a possible consequence of insufficient calorie intake. However, according to the Ministry of Health, the anthropometric indices of weight and length that are set for the population in general should not be considered as the optimum target when it comes to the health and growth of individuals with CP.[23] To date, there are no specific BMI values for adult individuals with CP.

According to TST assessment and adequacy, it could be found that the patients were with overweight, which indicates reserves of body fat,[24] but other body compartments were not assessed[25] and, therefore this method cannot be a good EN indicator for individuals with CP. With regard to MUAC and AMC, parameters that indicate the lean mass compartment, the patients showed low lean mass and low body weight, as usually found in studies on this population.[26]

The biochemical data of the studied individuals were within the normal reference values, which can be explained by the long time elapsed from the clinical diagnosis, body adaptation, or appropriate ENT.[27] Serum albumin is largely used as a marker of malnutrition, mortality and to predict possible complications.[28,29] Hypocholesterolemia (below 150mg/dl) has been studied as a marker of malnutrition, increased mortality and time of hospital stay,[30] while hypercholesterolemia is considered a risk factor for coronary artery disease.[31] Regarding hemoglobin concentration, studies have shown that an inadequate nutritional status represents a risk factor for the development of anemia.[32,33]

As found in this study, there was good tolerance to the enteral diet provided to these patients, probably because they were chronic EN patients, because of the good care provided by the multidisciplinary staff to the patients, as well as the staff's continued education.[34,35]

Enteral nutrition quality indicators are useful for monitoring the EN practice, because they allow knowing the safety, efficiency and cost-benefit ratio of this practice, and, if necessary, the development of a plan for corrective actions.[19,36] The indicators of frequency of BMI measurement, frequency of measurement or estimation of energy expenditure and protein needs in patients

receiving nutritional therapy indicated 100% of adequacy, because they are part of the institution's standard protocols.

Regarding the frequency of days of adequate energy intake by patients receiving enteral nutrition, it could be seen that 50% (n = 4) of the individuals were receiving inadequate calorie supply, i.e., the calorie intake was below 25 kcal/kg/day or above 35 kcal/kg/day. This is possibly correlated with an underestimated energy requirement.

With respect to the indicator of frequency of days of adequate proteins supply to the patients fed by enteral nutrition, it could be seen that 12.5% (n= 1) of the patients receive a protein supply lower than 0.8g/kg/day, and 12.5% (n=1) higher than 2.0g/kg/day, which can be associated with a poor distribution of macronutrients in the diet.

Regarding the indicator of frequency of days of adequate liquid administration to patients receiving enteral nutrition, there was 100% (n = 8) of adequacy, which may be correlated with an adequate estimate of the patients' needs, besides good acceptance of the enteral diet provided.

Obstipation can be characterized as the occurrence of less than one bowel movement in a period of three days.[37] In this survey, the main complication reported was constipation, in 75% of the individuals assessed, and such occurrence may affect the clinical evolution of the patients receiving ENT, because it is associated with abdominal distention, vomiting, intestinal obstruction and gastrointestinal perforation.[38] Obstipation is typical of CP,[8] and other causes may be related to associated drugs, insufficient enteral intake of dietary fibers and dehydration.[39,40]

Drugs that slow the motility of the gastrointestinal tract are the ones of the class of benzodiazepines and opioids.[38,41,42] The use of EM with dietary fibers can be considered a protection factor to prevent obstipation, but there is still lack of evidences about the amount and quality of the dietary fiber that must be indicated to prevent disturbances of the intestinal transit of patients receiving EN exclusively.[43] In this study, it was found that the enteral diets did not reach the recommended level of dietary fibers, which contribute to obstipation.

Conclusion

Malnutrition had high prevalence in the institutionalized patients studied, where ENT in such cases was the only feeding and nutrition route.

Adoption of clinical monitoring mechanisms, with a multidisciplinary team approach, creation and use of protocols, quality indicators and continuing education of health professionals can be key measures to ensure an adequate administration of ENT and provide greater health benefits to the patients. Therefore, the proposal of indicators of this study is of vital importance, considering the existing difficulties in the nutritional status assessment of adult patients with CP.

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