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Diagnosis of protein-energy deficiency in children with cerebral palsy

Z. F. Mavlyanova
Samarkand State Medical University, (18 Amir Temur str., Samarkand, Republic of Uzbekistan)

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✉ *Corresponding author:*
Zilola F. Mavlyanova
reab.sammi@mail.ru

Zilola F. Mavlyanova, Head of the department of medical rehabilitation, sports medicine and folk medicine, associate professor, doctor of medical sciences; *ORCID: 0000–0001–7862–2625*

Summary

Purpose of the study. To conduct a comprehensive assessment of nutritional status and diagnosis of protein-energy deficiency in patients with cerebral palsy.

Materials and methods. The nutritional status was studied in 214 children with cerebral palsy and 40 healthy children, the average age of the subjects was 6.7±0.27 years. The diagnosis of protein-energy deficiency in the subjects was based on clinical, anthropometric and laboratory parameters according to the Bilbreri-Kochen method, including subjective global assessment, shoulder muscle circumference, body mass index, skin-fat fold thickness over the triceps, absolute lymphocyte number and serum transferrin.

Results. 81.8% of children with cerebral palsy have signs of protein-energy deficiency of varying severity. The highest incidence of mild protein-energy malnutrition (PEM) was observed in forms G 80.1 and G 80.2–64.1% and 62.5%, respectively. The average degree of PEM was observed at form G 80.0 in more than half of children (58.1%), the lowest percentage of occurrence was recorded at G 80.1–10.3% (P<0.001). Severe PEM was diagnosed in cerebral palsy with severe motor deficiency, accounting for 30.2% of cases in children with form G 80.0 and 14.3% of observations with G 80.8, slightly less often with Forms G 80.3 — in 3.2% and with G 80.4 — in 3.8% of cases (P<0.001), which is determined not only by the most significant limitation of the level of physical activity in these forms of cerebral palsy, but also by the most pronounced disorders of oral-motor function in this category of patients.

EDN: JTYVEG

Keywords: protein-energy malnutrition, children, cerebral palsy

Conflict of interests. The authors declare no conflict of interest.

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Диагностика белково-энергетической недостаточности у детей с церебральным параличом

Мавлянова З. Ф.
Самаркандский государственный медицинский университет, (ул. Амира Темура, 18, Самарканд, Республика Узбекистан)

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✉ *Для переписки:*
Мавлянова Зилола Фархадовна
reab.sammi@mail.ru

Мавлянова Зилола Фархадовна, заведующая кафедрой медицинской реабилитации, спортивной медицины и народной медицины, доцент, д.м.н.

Резюме

Цель исследования. Провести комплексную оценку нутритивного статуса и белково-энергетической недостаточности у пациентов с детским церебральным параличом.

Материалы и методы исследования. Изучен нутритивный статус у 214 детей с детским церебральным параличом и 40 здоровых детей, средний возраст обследуемых составил 6,7±0,27 лет. Диагностика белково-энергетической недостаточности у исследуемых опиралась на клинические, антропометрические и лабораторные показатели по методу Билбрери-Кохен, включающие субъективную глобальную оценку, окружность мышц плеча, индекс массы тела, толщину кожно-жировой складки над трицепсом, абсолютное число лимфоцитов и трансферрин в сыворотке крови.

Результаты. 81,8% детей с детским церебральным параличом имеют признаки белково-энергетической недостаточности различной степени тяжести. Наибольшая частота встречаемости легкой степени БЭН отмечалась при формах G 80.1 и G 80.2–64,1% и 62,5% соответственно. Средняя степень БЭН отмечалась при форме G 80.0 у большей половины детей (58,1%), наименьший процент встречаемости был зафиксирован при G 80.1–10,3% (P<0,001). Тяжелая степень БЭН диагностирована при ДЦП с выраженным двигательным дефицитом, составляя 30,2% случаев у детей при форме G 80.0 и 14,3% наблюдений при G 80.8, несколько реже при формах G 80.3 — в 3,2% и при G 80.4 — в 3,8% случаях (P<0,001), что определено не только наиболее значимым ограничением уровня физической активности именно при данных формах детского церебрального паралича, но и наиболее выраженными нарушениями орально-моторной функции у данной категории пациентов.

Ключевые слова: белково-энергетическая недостаточность, дети, церебральный паралич

Конфликт интересов. Авторы заявляют об отсутствии конфликта интересов.

Cerebral palsy (CP) is a serious medical and social problem that has a significant impact not only on the decline in the quality of life, but also on the increase in the level of disability among the child population. According to the World Health Organization (WHO) «Cerebral palsy is the main cause of childhood neurological disability in the world, its incidence in the world is from 2–3.6 to 8 per 1000 newborns. Recently, the number of children with cerebral palsy has increased by 14% in the world, and its prevalence is 17 million» [5,15].

A tremendous impact on somatic health and quality of life in childhood, especially for children with pathology of the central nervous system. Nutritional deficiency leads to a slowdown and stunting in growth, a decrease in the volume of circulating blood and its rheology, suppression of the immune response, an increase in the child's irritability and spasticity [1,2,4,14].

According to Eun-Young Park et al., malnutrition is one of the main problems worldwide, and only 63% of children with cerebral palsy have a normal body mass index, while 16% are overweight and obese, and 20% are malnourished [13]. Patients with cerebral palsy constitute a risk group for protein-energy malnutrition. According to various researchers, malnutrition stated in 46–90% of children with cerebral palsy [1,2,4]. When assessing the nutritional status in children with cerebral palsy, it is necessary to take into account the fact that these children differ from healthy peers not only in terms of weight and height indicators, body composition, but also have a number of features that do not depend on nutritional status. This is a severe neurological deficit, features of movement, cognitive abilities, neuroendocrine factors, puberty [3,6].

Due to differences in body composition, simple isolated anthropometric measures used in other populations (weight/height, body mass index, arm circumference, single measurement of skin fold) do not predict nutritional status in children with cerebral palsy [5,12,14]. In this connection, in this category of patients, complex methods for diagnosing the assessment of malnutrition should be used.

In patients with cerebral palsy, in addition to the main neurological damage, especially in children with severe motor disorders, malnutrition is often noted, depending on the level of general motor dysfunction [8,10]. However, adequate nutrition for children is essential during the period of intensive growth and development, which is especially important in children with cirrhosis [9]. Regular nutritional assessment is essential and identifies signs and symptoms associated with malnutrition [11].

Despite the large number of works devoted to the study of cerebral palsy in children, in the literature available to us there are very few studies devoted to the study of the nutritional status and assessment of protein-energy malnutrition in patients with cerebral palsy.

Purpose of the study. To conduct a comprehensive assessment of the nutritional status and diagnosis of protein-energy malnutrition in patients with cerebral palsy.

Materials and research methods

The study was conducted on the basis of the pediatric neurology departments of Clinic No.1 of the Samarkand State Medical University and the Samarkand Regional Multidisciplinary Children's Medical Center. The diagnosis of a specific form of cerebral palsy was established based on the study of risk factors, medical history, clinical and neurological picture, standardized assessment of motor functions, as well as the results of neuroimaging and neurofunctional research methods. The inclusion criteria for the study were referral diagnosis of cerebral palsy (ICD-10 code G 80) of any clinical form. The clinical groups of the surveyed were research group – 214 patients diagnosed with cerebral palsy; control group – 40 somatically healthy children observed in family polyclinics in Samarkand.

Based on an in-depth clinical and neurological examination, patients were divided into 6 groups in accordance with the International Classification of Diseases, 10th revision (ICD-10), depending on the topographic form of cerebral palsy (Fig. 1):

Group 1 – spastic cerebral palsy, quadriplegia – G 80.0–20.1% (n = 43)

Group 2 – spastic diplegia – G 80.1–18.2% (n = 39)

Group 3 – children's hemiplegia (hemiparesis) – G 80.2–18.7% (n = 40)

Group 4 – dyskinetic cerebral palsy (athetosis, choreoathetosis) – G 80.3–14.5% (n = 31)

Group 5 – atactic cerebral palsy (atony) – G 80.4–12.1% (n = 26)

Group 6 – another type of cerebral palsy – G 80.8–16.4% (n = 35).

Among the examined children, patients with spastic cerebral palsy, quadriplegia G 80.0–20.1%. Children with atactic G 80.4–12.1% and dyskinetic forms G 80.3–14.5%. At the same time, the proportion of spastic forms among the total number of hospitalized children with cerebral palsy was 57%.

Diagnosis of protein-energy malnutrition (PEM) in the subjects was based on clinical, anthropometric and laboratory parameters according to the Bilbrery-Kohen method, including subjective global assessment(SGA), shoulder muscle circumference (ShMC), body mass index (BMI), skin-fat thickness folds over the triceps (SFThT), absolute number of lymphocytes (ANL) and transferring in the blood serum. Each sign was evaluated in points: norm – 0 points, slight deviations – 1 point, average – 2 points, strong – 3 points. After recalculation of all the above parameters, a total score was derived, according to which the severity of PEI was determined: 0–1 point – the state of nutrition is normal; 2–6 points – mild degree of PEM (E44.1 according to ICD-10); 7–12 points – average degree of PEM (E44.0 according to ICD-10); 13–18 points – severe PEM (E43.1 according to ICD-10).

Figure 1. Distribution of patients depending on the topographic form of cerebral palsy in accordance with ICD-10

Рисунок 1. Распределение больных в зависимости от топографической формы ДЦП в соответствии с МКБ-10

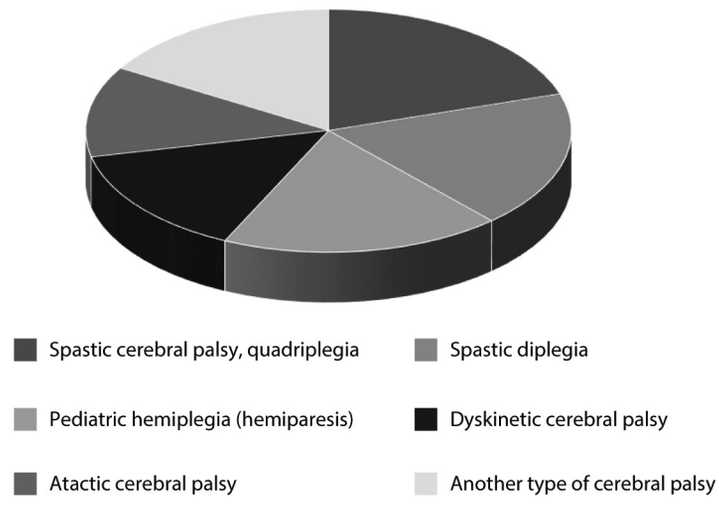


Table 1.
Subjective global assessment of children with cerebral palsy depending on its form
Таблица 1.
Субъективная глобальная оценка детей с ДЦП в зависимости от его формы

Forms of cerebral palsy		Weight loss	Anorexia	Loss of SF	Loss of muscle mass
G 80.0, n=43	n	42	43	42	43
	%	97.7	100.0	97.7	100.0
G 80.1, n=39	n	31	32	36	35
	%	79.5	82.1	92.3	89.7
G 80.2, n=40	n	37	30	38	35
	%	92.5	75.0	95.0	87.5
G 80.3, n=31	n	29	23	29	30
	%	93.5	74.2	93.5	96.8
G 80.4, n=26	n	26	25	25	25
	%	100.0	96.2	96.2	96.2
G 80.8, n=35	n	31	27	33	34
	%	88.6	77.1	94.3	97.1

Table 2.
Evaluation of malnutrition according to SGA in children with cerebral palsy depending on its topographic form
Таблица 2.
Оценка нарушений питания по СГО у детей с ДЦП в зависимости от его топографической формы

Forms of CP	Weight loss	Anorexia	Loss of PFA	Loss of muscle mass	Average score	Conversion
G 80.0, n =43	4.56±0.24	4.12±0.21	4.30±0.24	3.65±0.19	16.63±0.83	2.0±0.12
G 80.1, n =39	2.15±0.25*	1.90±0.19*	2.21±0.22*	2.18±0.21*	8.44±0.84*	0.72±0.11*
G 80.2, n =40	2.03±0.20*	1.83±0.20*	2.10±0.19*	1.5±0.16*	7.45±0.61*	0.60±0.11*
G 80.3, n =31	3.16±0.29*	1.84±0.25*	3.0±0.27*	2.84±0.25*	10.84±0.99*	1.23±0.15*
G 80.4, n =26	2.96±0.29*	3.04±0.30*	2.77±0.26*	2.08±0.19*	10.85±0.92*	1.1±0.15*
G 80.8, n =35	2.97±0.35*	2.60±0.35*	3.20±0.29*	2.77±0.26*	11.51±1.20*	1.23±0.18*
Note: * – reliability of data to the highest indicator (P<0.05–0.01)						

Results of the study and their discussion

An in-depth assessment of the nutritional status of children with cerebral palsy indicated malnutrition in the study group.When evaluating the parameter subjective global assessment (Table 1), it was found that the most pronounced frequency of occurrence of the subjective assessment of the criterion "weight loss" was observed in the group of children with the form G 80.4 (100%), the lowest – with G 80.1 (79.5%), which is 1.3 times less common, but no statistical significance was established (P>0.05).

Anorexia was noted in 100% of patients with the form G 80.0, while with G 80.3 the lowest percentage of occurrence was noted – 74.2%, however, statistical significance was also not established (P>0.05).

Loss of subcutaneous fat (SF) was noted in all forms of cerebral palsy, the percentage of severity of this symptom, diagnosed according to parents / guardians, varied from 92.3% (G 80.1) to 97.7% (G 80.0).

Loss of muscle mass was noted in all children with the form G 80.0 (100%), with the form G 80.1 – in 89.7%, with the form G 80.2 – in 87.5%, with the form G 80.3 – in 96.8%, with form G 80.4 – in 96.2% and with form G 80.8 – in 97.1%. The data obtained indicate a direct relationship between the loss of muscle mass and the restriction of physical activity in children with various forms of cerebral palsy, from 87.5% in children with hemiplegia to 100% in quadriplegia.

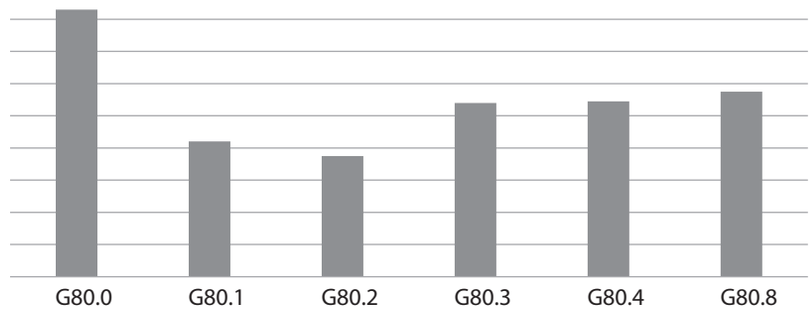
Analysis of the obtained indicators of the subjective global assessment (Table 2) showed the predominance of moderate and severe malnutrition in all respects in children with G 80.0 significantly more often than in other observation groups: weight loss – 4.56±0.24 points, anorexia – 4.12±0.21 points, loss of subcutaneous fat (SF) – 4.30±0.24 points, loss of muscle mass 3.65±0.19 points. The average subjective global score in this group was 16.63±0.83 points with a conversion of 2.0±0.12 points.

The least pronounced indicators of malnutrition according to SGA were noted in patients with G 80.2, so the indicators of weight loss were 2.03±0.20 points, anorexia – 1.83±0.20 points, loss of subcutaneous fat – 2.10±0,19 points, loss of muscle mass – 1.5±0.16 points, average total score 7.45±0.61, with a conversion of 0.60±0.11 points.

As a result, according to the Bilbrery-Kohen scale, according to the "subjective global assessment" parameter, children with the form G 80.0 scored the highest average score – 16.6±0.8 points, while the lowest score was scored by children with the form of cerebral palsy G 80.2–7.5±0.6 and G 80.1–8.44±0.8, which indicated the least pronounced malnutrition in these groups of

Figure 2. Mean SGA scores on the Bilbrery-Kohen scale in children with cerebral palsy depending on the form

Рисунок 2. Средние баллы СГО шкалы Билбрери-Кохен у детей с ДЦП в зависимости от формы



patients subjectively assessed by parents/guardians (Fig. 2).

The assessment of BMI showed that in the forms G 80.2 and G 80.1–47.5% and 30.8% of children, respectively had BMI indicators corresponding to the median 1SO-(+1SO), i.e. these indicators were within the normative values. With forms G 80.1, G 80.3 and G 80.4, the largest percentage of children had BMI indicators located in the median –2SO – (–1SO), which amounted to 53.8%, 41.9% and 46.1%, respectively, that is, a slight violation nutrition.

A moderate decrease in nutrition (–3SO-(–2SO)) is most often diagnosed at G 80.0 and G 80.3, accounting for 44.2% and 29.0%, respectively. In 19 children (44.2%) with form G 80.0 and in 7 patients (20.0%) with G 80.8, there was a pronounced malnutrition, BMI values were below the curve – 3SO (Table 3). It was noted that 95.4% of children with quadriplegia and 80.6% with dyskinetic cerebral palsy had malnutrition of varying severity when analyzing the obtained data on the BMI parameter. Less pronounced malnutrition was noted in the group of children with atactic cerebral palsy (76.9%) and mixed cerebral palsy (65.7%).

The thickness of the skin-fat thickness folds over the triceps (SFThT) among children with cerebral palsy is the most optimal indicator by which one can judge the level of nutritional status in this cohort of children [7]. According to the data obtained, we found that the indicators of the thickness of the skin-fat thickness folds over the triceps (SFThT) in children also depend on the form of cerebral palsy (Table 4).

Thus, in the form of G 80.2, 27.5% of children had indicators of the thickness of the SFThT within the 26th – 75th centile corridor with a score of 0 points. Whereas a score of 1 point was received by 60.0% of children, whose SFThT indicators were within the 25th – 10th centile corridor. In 12.5%, indicators were significantly more often within the 9th – 5th centile corridor, indicating a moderate decrease in nutrition (P<0.01).

Indicators of SFThT corresponding to age normative parameters were noted in less than half of children with G 80.1, accounting for 41.0%; somewhat less often with G 80.3, G 80.4 and G 80.8 forms of cerebral palsy (19.3%, 19.2% and 20.0% of cases, respectively). The most pronounced changes in the study of the SFThT parameter were noted in the group of children with G 80.0, only 4.7% of patients in the study of this indicator did not have malnutrition. In this group of patients, moderate and severe malnutrition prevailed, diagnosed in 44.2% and 39.5% of children, respectively. Somewhat less frequently, in 11.6% of cases, mild malnutrition was recorded with a score of 1 point.

In 78% of children with cerebral palsy, the study of the SFThT parameter revealed low rates, indicating a decrease in fat mass and the presence of nutritional status disorders, which can be used as a screening method for diagnosing the risk of developing PEI in children with neurological symptoms.

When analyzing the obtained parameters of shoulder muscle circumference (ShMC) among children with cerebral palsy, it was found that in the forms G 80.2, G 80.1 and G 80.4 in more than half of the subjects, the indicators were within the age norm, amounting to 72.5%, 56.4% and 53.8% in observation groups, respectively. Whereas at G 80.0, G 80.3 and G 80.8 malnutrition of varying severity was noted, accounting for 55.8% with quadriplegia, 51.5% with dyskinetic and 60.0% with a mixed form within the 25th – 10th centile corridor with a score of 1 point. The most pronounced decrease in the indices of shoulder muscle circumference (ShMC) was noted in the group of children with cerebral palsy G 80.0, accounting for 90.7% of all observations (Table 5).

According to the modified Bilbrery-Kohen scale the total assessment of the above parameters of the degree of protein-energy malnutrition (PEM) showed a different frequency of occurrence of the degree of nutritional deficiency from the absence of PEM to severe, depending on the depth of the motor deficit and the form of the disease (Table 6).

From the presented data, the absence of manifestations of PEM was observed in most cases with forms G 80.1 and G 80.2 (25.6% and 25.0%, respectively), while with form G 80.0 only in 4.7%, malnutrition was not diagnosed, which was significantly significant (P<0.001).

After analyzing the data given in the table, we can conclude that the absence of signs of PEM in children with quadriplegia was significantly lower in relation to all forms of cerebral palsy. Also, a mild degree of PEM was significantly less common in the G 80.0 form in relation to all forms of cerebral palsy (P<0.01). The highest incidence of mild PEM was noted in the forms G 80.1 and G 80.2–64.1% and 62.5%, respectively. While in other forms of cerebral palsy, a mild degree of PEM was recorded in the following percentage – 45.2% at G 80.3, 42.3% at G 80.4 and 34.3% at G 80.8.

In most cases the average degree of PEM was noted in the form of G 80.0 in more than half of the children (58.1%), the smallest percentage of occurrence was recorded at G 80.1–10.3%, which was significantly significant (P<0.001). Somewhat less frequently, moderate malnutrition was recorded at G 80.3 (35.5%), G 80.4 (34.6%) and G 80.8 (31.4%), being detected in almost every third child from the group.

Table 3.
BMI indicators among children with cerebral palsy depending on its form
Таблица 3.
Показатели ИМТ среди детей с ДЦП в зависимости от его формы

Forms of cerebral palsy	BMI indicators								Malnutrition by group	
	-3SO		-3 SO-(–2SO)		-2SO -(–1SO)		-1SO-(+1SO)			
	n	%	n	%	n	%	n	%	n	%
G 80.0, n=43	19	44.2**	19	44.2**	3	7.0	2	4.6	41	95.4
G 80.1, n=39	1	2.6***	5	12.8**	21	53.8	12	30.8	27	69.2
G 80.2, n=40	0	0.0	7	17.5**	14	35.0	19	47.5	21	52.5
G 80.3, n=31	3	9.7***	9	29.0	13	41.9*	6	19.4	25	80.6
G 80.4, n=26	4	15.4	4	15.4	12	46.1*	6	23.1	20	76.9
G 80.8, n=35	7	20.0	10	28.6	6	17.1*	12	34.3	23	65.7

Note: * – reliability of values in relation to the indicators of the –1SO -(+1SO) group (*- P<0.05; ** – P<0.01; *** – P<0.001)

Table 4.
Indicators of the thickness of the skin-fat thickness folds over the triceps (SFThT) in children with cerebral palsy, depending on its form
Таблица 4.
Показатели толщины КЖСТ у детей с ДЦП в зависимости от его формы

Forms of cerebral palsy	SFThT thickness indicators							
	26th – 75th percentile		25th – 10th percentile		9th – 5th percentile		below 5th percentile	
	n	%	n	%	n	%	n	%
G 80.0, n=43	2	4.7	5	11.6*	19	44.2***	17	39.5***
G 80.1, n=39	16	41.0	21	53.9	2	5.1***	0	0.0
G 80.2, n=40	eleven	27.5	24	60.0*	5	12.5**	0	0.0
G 80.3, n=31	6	19.3	15	48.4**	8	25.8	2	6.5***
G 80.4, n=26	5	19.2	13	50.0**	6	23.1	2	7.7***
G 80.8, n=35	7	20.0	14	40.0*	9	25.7	5	14.3

Note: * – reliability of values in relation to the indicators of the group of children with the 75th percentile
(* – P<0.05; ** – P<0.01; *** – P<0.001)

Table 5.
Indicators of the circumference of the shoulder muscles among children with cerebral palsy, depending on the topographic shape
Таблица 5.
Показатели окружности мышц плеча среди детей с ДЦП в зависимости от топографической формы

Forms of cerebral palsy	Indicators of ShMC							
	26th – 75th percentile		25th – 10th percentile		9th – 5th percentile		below 5th percentile	
	n	%	n	%	n	%	n	%
G 80.0, n=43	4	9.3	24	55.8***	8	18.6*	7	16.3
G 80.1, n=39	22	56.4	17	43.6	0	0.0	0	0.0
G 80.2, n=40	29	72.5	10	25.0*	1	2.5	0	0.0
G 80.3, n=31	12	38.7	16	51.6	3	9.7***	0	0.0
G 80.4, n=26	14	53.8	12	46.2	0	0.0	0	0.0
G 80.8, n=35	9	25.7	21	60.0**	3	8.6***	2	5.7***

Note: * – reliability of values in relation to the indicators of the group of children with the 26th-75th percentile
(* – P<0.05; ** – P<0.01; *** – P<0.001)

Table 6.
The incidence of PEM among children with cerebral palsy depending on the form of the disease
Таблица 6.
Частота встречаемости БЭН среди детей с ДЦП в зависимости от формы заболевания

Forms of cerebral palsy	The degree of protein-energy malnutrition							
	Absence		Light degree (E 44.1)		Average degree (E 44.0)		Severe degree (E 43.1)	
	n	%	n	%	n	%	n	%
G 80.0, n=43	2	4.7	3	7.0	25	58.1	13	30.2
	P80.0–80.1<0.001 P80.0–80.2<0.001 P80.0–80.3<0.05 P80.0–80.4<0.05 P80.0–80.8<0.05		P80.0–80.1<0.001 P80.0–80.2<0.001 P80.0–80.3<0.05 P80.0–80.4<0.05 P80.0–80.8<0.05		P80.0–80.1<0.001 P80.0–80.2<0.001 P80.0–80.3>0.05 P80.0–80.4>0.05 P80.0–80.8>0.05		P80.0–80.3<0.001 P80.0–80.4<0.001 P80.0–80.8<0.05	
G 80.1, n=39	10	25.6	25	64.1	4	10.3	0	0
	P80.1–80.2>0.05 P80.1–80.3>0.05 P80.1–80.4>0.05 P80.1–80.8>0.05		P80.1–80.2>0.05 P80.1–80.3>0.05 P80.1–80.4>0.05 P80.1–80.8>0.05		P80.1–80.2>0.05 P80.1–80.3<0.01 P80.1–80.4<0.01 P80.1–80.8<0.01			
G 80.2, n=40	10	25.0	25	62.5	5	12.5	0	0
	P80.2–80.3>0.05 P80.2–80.4>0.05 P80.2–80.8>0.05		P80.2–80.3>0.05 P80.2–80.4>0.05 P80.2–80.8>0.05		P80.2–80.3<0.05 P80.2–80.4>0.05 P80.2–80.8>0.05			
G 80.3, n=31	5	16.1	14	45.2	11	35.5	1	3.2
	P80.3–80.4>0.05 P80.3–80.8>0.05		P80.3–80.4>0.05 P80.3–80.8>0.05		P80.3–80.4>0.05 P80.3–80.8>0.05		P80.3–80.4>0.05 P80.3–80.8<0.01	
G 80.4, n=26	5	19.2	11	42.3	9	34.6	1	3.8
	P80.3–80.8>0.05		P80.3–80.8>0.05		P80.3–80.8>0.05		P80.3–80.8>0.05	
G 80.8, n=35	7	20.0	12	34.3	11	31.4	5	14.3
Total:	39	18.2	90	42.1	65	30.4	20	9.3

Severe in most cases was diagnosed in cerebral palsy with severe motor deficit, accounting for 30.2% of cases in children with G 80.0 and 14.3% of cases with G 80.8, somewhat less often with G 80.3 forms – in 3.2% and with G 80.4 – in 3.8% of cases ($P < 0.001$).

Conclusions

Thus, 81.8% of children with cerebral palsy have signs of protein-energy deficiency of varying severity. Most often, severe forms of PEM are observed in such forms of cerebral palsy as G 80.0, G 80.3 and G 80.4, which is determined not only by the most significant limitation of the level of physical activity in these forms of cerebral palsy, but also by the most pronounced impairment of oral-motor function in this category patients.

Therefore, the assessment of nutritional status in children with cerebral palsy should be comprehensive, taking into account not only clinical and neurological symptoms, but functional, anthropometric and laboratory indicators with a mandatory study of the features of nutritional history.

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