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Olga P. Kovtun[1], Anna N. Plaksina[2], Elena A. Dugina[1, 2]

[1] Urals State Medical University, Yekaterinburg, Russian Federation
[2] Multipurpose Clinical Medical Center «BONUM», Yekaterinburg, Russian Federation

Consistency in Assessing Physical Development of Children with Cerebral Palsy according to Regional and Specialized Centile Scales: A Population-Based Cross-Sectional Study

Corresponding Author:
Anna N. Plaksina, MD, PhD, acting Deputy Chief Physician of the Multipurpose Clinical Medical Center «Bonum»
Address: 9a, Bardina St, Yekaterinburg, 620019, **tel:** +7 (343) 240-42-68, **e-mail:** plaxina@bonum.info
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Background*. Children with infantile cerebral palsy (ICP) often have a physical developmental delay due to protein-energy malnutrition (PEM). The assessment of such abnormalities using different centile scales may lead to inconsistent results.* ***Objective****. Our aim was to study the consistency in assessing physical development of children with ICP using regional and specialized centile scales.* ***Methods.*** *The assessment of physical development with determination of the proportion of patients with PEM (weight-age and/or heightage values < 10th percentile) was carried out using regional centile scales and the Life Expectancy Project scales taking into account motor disorder levels (I–V) according to GMFCS. The assessment of motor disorders was performed by neurologists of healthcare organizations in 54 municipalities of the Sverdlovsk Region. The accounting period was from September 2016 to January 2017.* ***Results****. According to regional centile scales, PEM was identified in 272 (35.7%) children; according to the Life Expectancy Project scales — in 56 (7.4%) out of 761 children with ICP (McNemar's criterion, p <0.001). Using regional scales the following results were registered: children with GMFCS I had PEM 5 times less than children with GMFCS V — 10 (12.5%) and 107 (66%) cases, respectively (2 criterion, p <0.001). When assessing physical development of children with specialized scales, PEM occurred in 4 (5%) patients with GMFCS I and 18 (11.1%) with GMFCS V (p < 0.001).* ***Conclusion****. Specialized scales for assessing physical development less often indicate the presence of PEM in children with ICP. When using regional and to a much lesser extent specialized centile scales, the detection rate for PEM cases depends on the level of motor disorders.*

Key words*: children, infantile cerebral palsy, physical development, assessment, centile scales, Life Expectancy Project, consistency.*

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Table 1. Level of disorders in gross motor skills according to GMFCS in children with infantile cerebral palsy

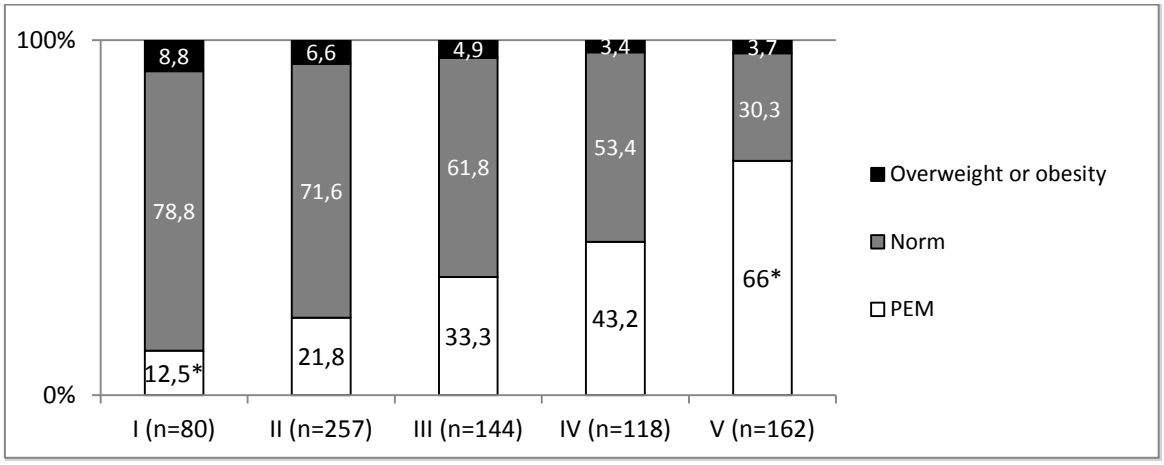
GMFCS level	**Patients with infantile cerebral palsy, abs. (%)**		
	Boys (*n* =428)	**Girls (*n* =333)**	**Total (*n* =761)**
I	41 (9.6)	39 (11.7)	80 (10.5)
II	135 (31.5)	122 (36.6)	257 (33.8)
III	83 (19.4)	61 (18.4)	144 (18.9)
IV	67 (15.7)	51 (15.3)	118 (15.5)
V	102 (23.8)	60 (18)	162 (21.3)

Table2. The assessment of physical development in boys and girls by regional and specialized centile scales in the structure of GMFCS levels

GMFCS level	**PEM, abs. (%)**		**Norm, abs. (%)**		**Overweight or obesity, abs. (%)**	
Regional centile scales						
Number of children	Boys	Girls	Boys	Girls	Boys	Girls
I (*n* =43/39)	5 (11.6)	5 (12.8)	33 (76.7)	32 (82.1)	5 (11.6)	2 (5.1)
II (*n* =135/122)	34 (25.2)	30 (24.6)	92 (68.1)	84 (68.8)	9 (6.7)	8 (6.6)
III (*n* =83/61)	31 (37.3)	17 (27.9)	48 (57.9)	41 (67.2)	4 (4.8)	3 (4.9)
IV (*n* =67/76)	25 (37.3)	51 (51)	40 (59.7)	23 (45.1)	2 (3.0)	2 (3.9)
V (*n* =102/60)	68 (66.7)	39 (65.0)	31 (30.4)	18 (30.0)	3 (2.9)	3 (5.0)
Life Expectancy Project scales						
Number of children	Boys	Girls	Boys	Girls	Boys	Girls
I (*n* =43/39)	3 (7.0)	1 (2.6)	32 (74.4)	34 (87.1)	8 (18.6)	4 (10.3)
II (*n* =135/122)	6 (4.4)	12 (9.8)	111 (82.2)	94 (76.9)	18 (13.3)	16 (13.3)
III (*n* =83/61)	9 (10.8)	0	60 (72.3)	45 (73.8)	14 (16.9)	16 (26.2)
IV (*n* =67/76)	5 (7.5)	5 (9.8)	51 (76.1)	38 (74.5)	11 (16.4)	8 (15.7)
V (*n* =102/60)	12 (11.8)	6 (10)	72 (70.5)	44 (73.3)	18 (17.7)	10 (16.7)

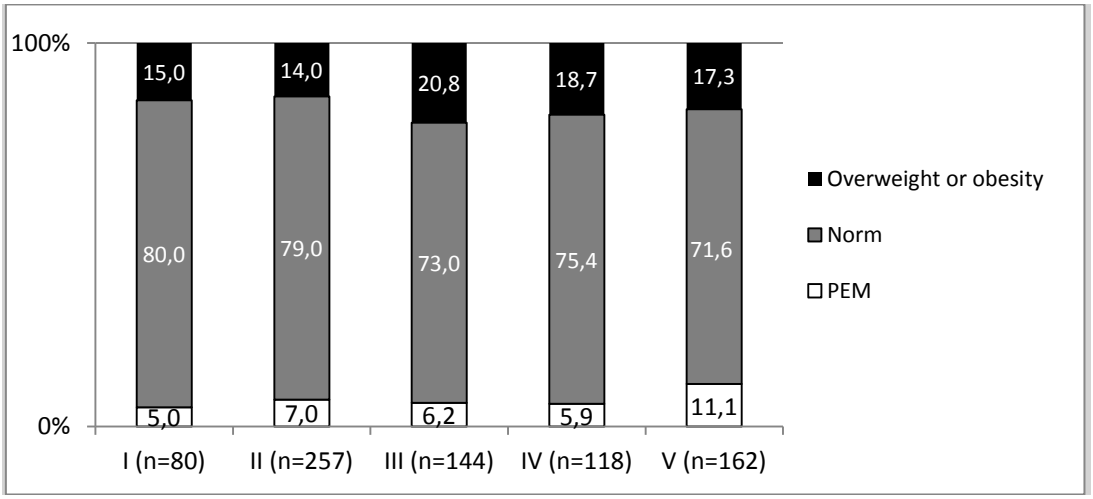
Note. PEM **—** protein-energy malnutrition.

Fig. 1. The assessment of physical development of children by regional centile scales in the structure of GMFCS levels



Note. The differences in distribution of physical development groups among children with different levels of disorders in gross motor skills were statistically significant (p <0.001, df =8). * — statistically significant (p <0.001) differences in GMFCS I and V groups in terms of «proportion of children with PEM». Differences in terms of «proportion of children with overweight or obesity» were not found (p = 0.102). PEM — protein-energy malnutrition.

Fig. 2. The assessment of physical development of children by the Life Expectancy Project scales in the structure of GMFCS levels



Note. No differences were found in distribution of physical development groups among children with different levels of disorders in gross motor skills (p =0.395, df =8). The proportion of children with PEM and overweight or obesity in groups with GMFCS I and V was the same (p =0.120 and 0.653, respectively). PEM — protein-energy malnutrition.

FINANCING SOURCE
Not specified.

CONFLICT OF INTERESTS
Not declared.