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NEUROLOGICAL CHANGES IN CHILDREN SUFFERING FROM TYPE 1 DIABETES MELLITUS

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Relevance. Diabetes mellitus (DM), or impaired carbohydrate metabolism, continues to be one of the most urgent problems in global medicine. Diabetic complications lead to high morbidity and mortality, as well as significant consumption of limited medical resources. Diabetes mellitus is a chronic metabolic disease that develops as a result of absolute insulin deficiency in type 1 DM, or its relative deficiency and insulin resistance in type 2 DM (1).
The significant expansion of the age boundaries of diabetes, the development of numerous complications, and the high rates of disability and mortality determine the priority position of diabetes mellitus in national healthcare programs in all countries of the world, as established by WHO regulatory documents (3).

Keywords: diabetes mellitus, adolescents, children, cognitive deficit, neurophysiological aspects.

Aim of the study: Based on clinical-neurological and neurophysiological analysis, to determine the nature and severity of various neurocognitive impairments in children and adolescents with type 1 diabetes mellitus, with the further goal of optimizing approaches to diagnosis and correction.

Materials and methods: We observed 102 patients aged 7 to 18 years who were receiving inpatient treatment for type 1 diabetes mellitus in the pediatric department of the Republican Specialized Scientific and Practical Medical Center of Endocrinology of the Ministry of Health of the Republic of Uzbekistan.

Research results. We examined 102 patients aged 7 to 18 years who were receiving inpatient treatment for type 1 diabetes mellitus. Among the examined patients, 57 (55.8%) were children whose age at the time of diabetes manifestation was younger than 7 years. Patients whose age at disease onset was older than 7 years accounted for 45 (44.0%) children (Table1).

Table 1.

Distribution of patients by disease duration and age at the time of diabetes manifestation (absolute number, %).

Duration of diabetes	| Age at the time of manifestation		P
	Younger than 7 years	Older than 7 years	

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	n =57	n =45	
Up to 3 years (33)	6 (10,5%)	27 (60,0%)	<0,001*
3–6 years (32)	18 (31,6%)	14 (31,1%)	
More than 6 years (37)	33 (57,9%)	4 (8,9%)	

*– the differences in indicators are statistically significant ($p < 0.05$).

In terms of diabetes duration, in the group with a disease history of up to 3 years, there was a significant predominance of children whose disease manifested after the age of 7 — 27 (60.0%). In contrast, in the group of children with a diabetes duration of more than 6 years, there was a significant dominance of those whose disease manifested before the age of 7 — 33 (57.9%). Patients with a disease duration of 3 to 6 years showed an almost equal distribution — 18 (31.6%) and 14 (31.1%), respectively.

In practical neurology, the main diagnostic criterion is the assessment of neurological status, as it is crucial for determining the degree of brain damage and choosing further treatment tactics. During the neurological examination, all patients with type 1 diabetes demonstrated clinical manifestations of cerebral disorders, differing in frequency and severity (Table 2).

Table **2.**

Results of the neurological status assessment in patients with type 1 diabetes mellitus (n, %).

Indicator	Абс.	%	95% ДИ
Dancing–Kunakov	32	31,4	22,5 – 41,3
Weak convergence	41	40,2	30,6 – 50,4
Diplopia	1	0,98	0,0 – 5,3
Limitation of eye movements	1	1,96	0,0 – 5,3
Horizontal nystagmus	17	16,7	10,0 – 25,3
Tenderness at Valle's point	33	32,4	23,4 – 42,3
Asymmetry of the nasolabial folds	9	8,8	4,1 – 16,1
Muscle tone in the upper limb			
Hypotonia	14	13,7	7,7 – 22,0
Hypertonus	1	1,0	0,0 – 5,3
Muscle tone in the lower limb			

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Hypotonia	14	13,7	7,7 – 22,0
Hypertonus	1	1,0	0,0 – 5,3
Reflex system			
Hyperreflexia in the upper limb	16	15,7	9,2 – 24,2
Hyporeflexia in the lower limb	29	28,4	19,9 – 38,2
Coordination system			
Ataxia	2	2,0	0,2 – 6,9
Romberg's posture	11	10,8	5,5 – 18,5
Intention tremor	32	31,4	22,5 – 41,3
Extrapyramidal syndrome	6	5,9	2,2 – 12,4

* – the differences in indicators are statistically significant ($p < 0.05$).

Neurological involvement of the cranial nerves was characterized by mild focal symptoms, such as a positive Dancing–Kunakov sign in 32 (31.4%) patients, tenderness at Valle's points in 33 (32.4%), horizontal nystagmus in 17 (16.7%), and weak convergence in 41 (40.2%). All these signs were most likely associated with the presence of cephalgic syndrome in this category of patients. In addition, isolated cases of nasolabial fold asymmetry, diplopia, and limitation of eye movements were detected.

In the motor sphere, hypotonia of the arms and legs was found in 14 (13.7%) cases. Increased tendon reflexes in the upper and lower limbs were registered in 16 (15.7%) patients, while decreased reflexes were noted in 29 (28.4%) patients. In the coordination system, the most common findings were intention tremor in 32 (31.4%) and instability in the Romberg position in 11 (10.8%) patients. Extrapyramidal syndrome was identified in 6 (5.9%) children (2). Thus, in the examined children—regardless of the stage of compensation and disease duration—mild focal neurological symptoms were observed, reflecting diffuse involvement of various parts of the brain.

Conclusion: The most common complaints in patients with cognitive deficits associated with type 1 diabetes mellitus are manifestations of astheno-neurotic syndrome ($p = 0.154$), signs of cephalgic syndrome (52.7%), and symptoms of psycho-emotional tension (23.5%), which increase with worsening metabolic compensation ($p < 0.001$*) and disease duration ($p < 0.001$*). Cognitive dysfunctions (24.5%) also become significantly more pronounced as the duration of the disease increases ($p < 0.001$*). In children and adolescents with type 1 diabetes, mild cognitive impairments are present in 45.5% of cases, while moderate impairments occur in 54.4% of cases. These disorders manifest primarily as reduced memory and attention.

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