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Study of Brain Neurotrophic Factor BDNF in Patients with Chronic Cerebral Ischemia and Type 2 Diabetes Mellitus

Usmanova D. D.[1,*], Nadjmitdinov O. B.[2]

[1]Docent of Neurology, Pediatric Neurology and Medical Genetics Department of Tashkent Pediatric Medical Institute, Uzbekistan
[2]Head of the Medical Radiology and Clinic Laboratory Duagnostics, Epidemiology, Sanitation Hygiene Department of Andijan State Medical Institute, Andijan, Uzbekistan

Abstract Brain-derived neurotrophic factor - BDNF is a neurotrophin (NT) that plays important roles in maturation, synaptic communication, neuronal repair and plasticity of the central nervous system (CNS), and also influences the pathology and treatment of neurological diseases. In addition to its fundamental effects on the nervous system, several reports have documented an association between plasma BDNF and systemic or peripheral inflammatory conditions such as acute coronary syndrome and type 2 diabetes.

Keywords Brain neurotrophin factor, Neurotrophin, Chronic cerebral ischemia, Diabetes mellitus

1. Relevance

Diabetes mellitus (DM) type 2 is a complex disease and a serious public health problem worldwide. In pure terms type 2 diabetes is a group of metabolic diseases characterized by chronic hyperglycemia followed by impaired insulin secretion and action. It is believed that genetic and environmental factors are responsible for the development of type 2 diabetes [1]. In addition, it has been observed that type 2 diabetes is associated with inflammation [2,5].

Brain neurotrophin factor (BDNF) is a neurotrophin (NT) that plays an important role in maturation, synaptic communication, neuronal repair, and plasticity of the central nervous system (CNS), and also affects the pathology and treatment of neurological diseases [2,3,7]. In addition to its fundamental effects on the nervous system, it also has an important role in the development of neuropathy. Several reports have documented the association between plasma BDNF and systemic or peripheral inflammatory conditions such as acute coronary syndrome and type 2 diabetes [4]. BDNF has attracted attention due to its possible role in protecting against the progression of type 2 diabetes, as well as cognitive decline in CIM [6]. Some studies suggest that BDNF may be a future target for the development of new antidiabetic therapies.

* Corresponding author:
durdona.usmanova@mail.ru (Usmanova D. D.)
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Objective: to study the relationship between the level of BDNF in the blood serum and the cognitive sphere in patients with CIM.

2. Material and Methods of Research

The quantitative content of brain- derived neurotrophic factor (BDNF) in the blood serum of the studied individuals was studied in 96 individuals, i.e., in 10 of the control group and 43 in group 1 and 43 – 2 in group 2.

3. Research Results

The results of studying the neurotrophic factor BDNF in the blood serum of 96 subjects showed the following: in the control group, the quantitative content of BDNF was 1326.2,2±19.6, [1203-1407] pg/ml; in 1group 1: BDNF was 821.8,8±11.2 [622.1-1012.4,4] pg/ml, ino 2 group 2: BDNF was It is equal to, 7965.7±9.1, [722.9,9-1199.6,] pg/ml ($p<0.05$) (Fig. 1).

When comparing the level of neurotrophic factor BDNF in both group, other statistical differences were revealed. B Table 1 shows that the level of BDNF in group 1 was 821.8,8±11.2 [622.1-1012.4,4] pg/ml, was statistically lower compared to 2 group – 2 -965.7,7±9.1, [722.9,9-1199.6,] pg/ml ($p<0.05$) and in the control group -1321326.2,2±19.6, [1203-1407] pg/ml, ($p<0.001$).

Table 1. Indicators of neurotrophic factor BDNF by groups, (M±m)

Indicator	Control group, n=10	Grupps	
		1 group of CIM with type 2 DM, n=43	2 group of CIM without DM, n=43
BDNF, pg/ml	1326,2±19,6 [1203-1407]	821,8±11,2 [622,1-1012,4] ***++	965,7±9,1 [722,9-1199,6] ***

Note: * - significance of indicators between the control group and comparison groups (*** - p<0.001); + - significance of indicators between comparison groups (+ - p<0.05, ++ - p<0.01); M±m, - average value, QQ1-lower quartile, QQ3 - upper quartile.

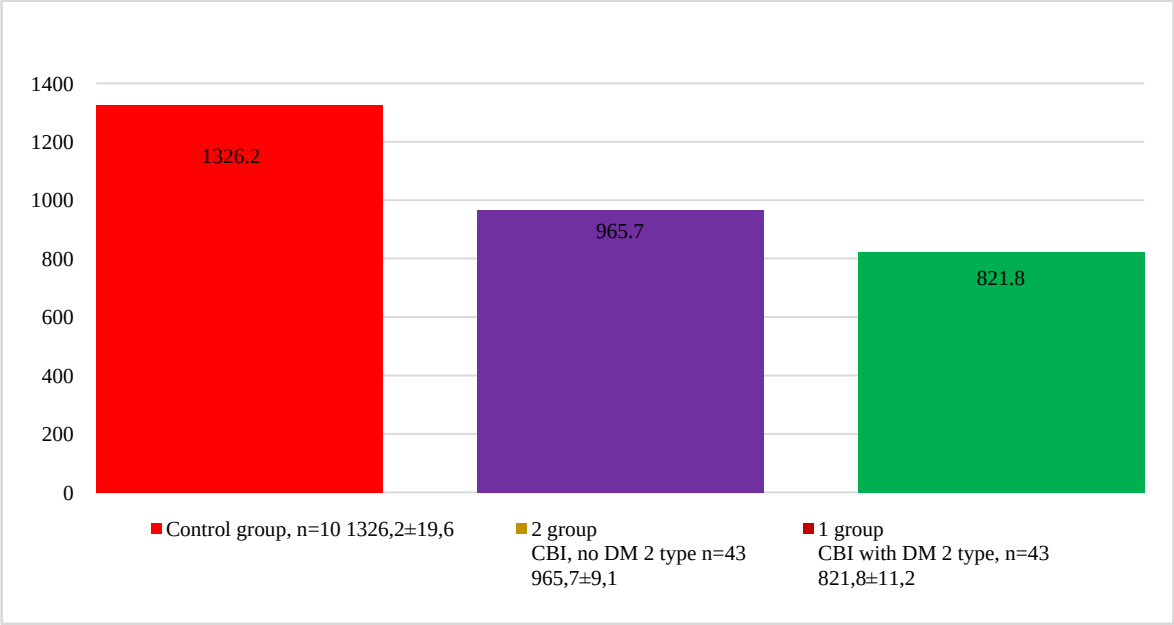

Figure 1. BDNF values in blood serum in patients of the control group, 1 and 2 group in the comparative aspect

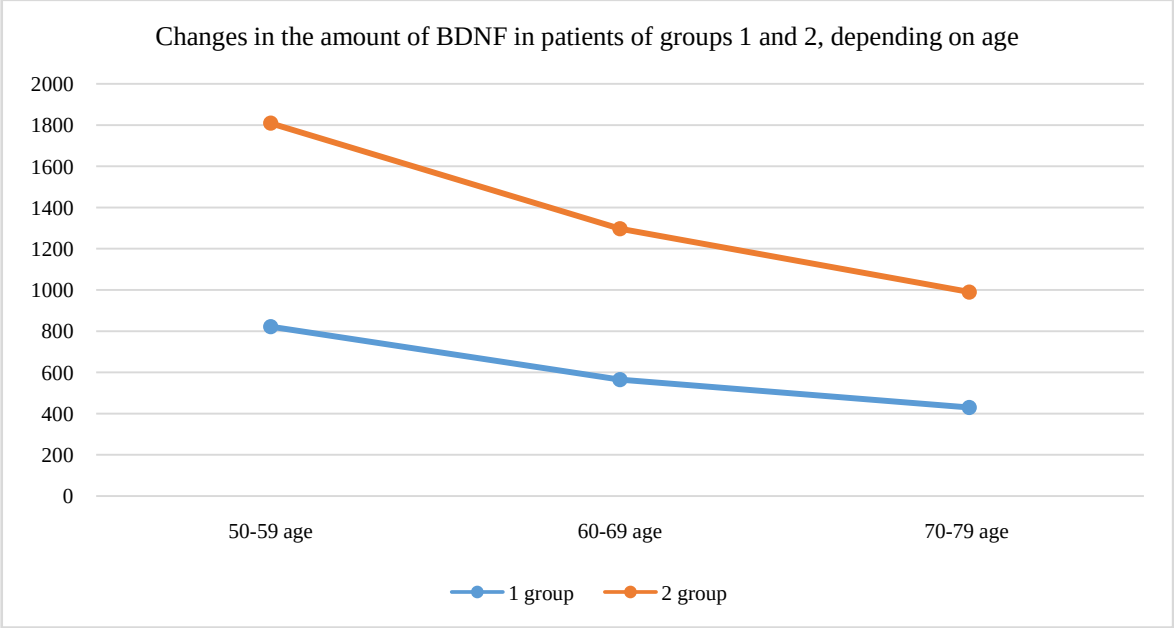

Figure 2. Indicators of neurotrophic factor BDNF in blood serum in individuals of groups 1 and 2, depending on the age of the patient

An analysis of the comparison of the total content of neurotrophic factor by age category among all the comparison group studied shows that the level of BDNF was significantly higher in the age group of 50-59 years than in the group of people aged 60-69 years (p<0.01) and 70-79 years (p<0.001) (Fig. 2).

When comparing the quantitative content of neurotrophina BDNF among the groups by age, it was found that the level

of BDNF in each age category is significantly lower in patients of 1group 1 of CIM with type 2 diabetes than in patients of 2group 2 of CIM without diabetes (p<0.001).

Table 2. The indicator of neurotrophin BDNF in blood serum in patients of 2 groups, depending on age, M±m, n=86

Age	BDNF, pg/ ml	
	1 group of CIM with type 2 DM, n=43	2 group of CIM without DM, n=43
50-59 years	822.2±3.0	987.1±3.00×××
60-69 years	565±6,7,7***	732,2±4,5,5×××***
70-79 years	430,8±2,3***+++	560,5,5±5,2×××***+++

Note: ×- significance of neurotrophin indicators between groups by age; * - significance of neurotrophin indicators in each group by age from 50-59 years; + - significance of indicators from 60-69 years; ° - significance of indicators from 70-79 years (differences are significant: ×××* * * + + +°°° - p<0.001).

Assessment of the level of neurotrophic factors in groups depending on age shows that BDNF levels in groups 1 and 2 at the age of 50-59 years are statistically higherthan at the age of 60-69 years (p<0.001) and 70-79 years (p<0.001) (Table 2). Correlation assessment of the age of patients with neurotrophin levelsand BDNF showed that in both groups they had an inverse relationship, i.e. the older the age, the lower the level of BDNF.

4. Conclusions

An analysis of the comparison of the total content of neurotrophic factor by age category among all the comparison group studied shows that the level of BDNF was significantly higher in the age group of 50-59 years than in the group of people aged 60-69 years (p<0.01) and 70-79 years (p<0.001) Thus, the studied patients CIM patients with type 2 diabetes had low levels of BDNF in theыворотке blood serum.

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