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BRAIN-DERIVED NEUROTROPHIC FACTOR AS A SPECIFIC MARKER IN THE PATHOGENESIS OF MIGRAINE

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Relevance: Migraine is one of the most common neurological disorders, affecting 10–15% of the world's population, and it often significantly impairs work capacity during the most productive years of life [10]. Migraine is a benign primary headache disorder and ranks as the second most common type after tension-type headache. According to WHO data from 2000, migraine ranks 19th among men and 12th among women in the list of diseases affecting work capacity worldwide, and it occupies a leading position among neurological disorders [1].

Epidemiological studies show that migraine occurs 1.5–2 times more frequently in women than in men: in 11–25% of women and 4–10% of men. The disease most often first manifests between the ages of 10 and 20 years, reaches maximum headache severity at 35–45 years, and migraine attacks usually cease at 55–60 years. In 60–70% of cases, the disease has a hereditary nature [2,3]. According to modern medical data, patients with migraine may develop cognitive impairment, acute vascular pathologies (migraine stroke), as well as degenerative changes in the white matter of the brain. Neuroimaging studies indicate that in women and pregnant patients with migraine, the risk of migraine-associated vascular disease increases up to 16-fold [5].

Basilar migraine occupies an important place among complicated forms of migraine. According to the International Classification of Headache Disorders, basilar migraine is a type of migraine with aura originating from the brainstem or cerebral hemispheres and is not accompanied by motor weakness [6]. Symptoms of basilar migraine include dysarthria, vertigo, tinnitus, hypoacusis, diplopia, bilateral paresthesia, decreased level of consciousness, and ataxia. In addition, many patients experience visual and sensory aura alternating with headache. A typical basilar migraine attack begins with visual disturbances (photophobia, alternating with bilateral visual loss), followed by vertigo, ataxia, dysarthria, tinnitus, short-term paresthesia in the arms and legs, severe throbbing headache in the occipital region, nausea, and in 30% of cases, brief loss of consciousness. Basilar migraine is considered a rare form. Vertigo is systemic and may last from several minutes to several hours [10].

Brain-derived neurotrophic factor (BDNF) is the most abundant neurotrophin in the brain and has been identified as an important modulator of central and peripheral pathways. BDNF contributes to central sensitization and is co-expressed with the calcitonin gene-related peptide (CGRP) gene in neurons of the trigeminal ganglion, which plays a key role in migraine development. In addition, a significant decrease in BDNF levels has been detected in patients with migraine. Thus, alterations in BDNF metabolism play an important role in the pathogenesis of migraine. The Val66Met (rs6265) polymorphism is the most common and well-studied variant of the BDNF gene. Recently, the rs2049046 polymorphism has also been found to be associated with migraine. Transcription of the BDNF gene influences the occurrence of migraine attacks. In recent years, the relationship between the BDNF gene and migraine attacks has attracted increasing attention; however, the exact role of these disturbances in patients remains unclear.

Aim. To determine the specificity of brain-derived neurotrophic factor as a marker in the pathogenesis of migraine.

Materials and Methods: We observed 87 patients in inpatient and outpatient settings at the Neurology Department of the "Kholis" private clinic. Blood samples were analyzed at the "Modus" private clinic using a Mindray analyzer, where ELISA testing was performed. The 87 selected patients were divided into three groups: the first group consisted of 30 patients with

episodic (simple) migraine, the second group included 30 patients with complicated migraine, and the third group comprised 27 healthy individuals. The age of patients ranged from 17 to 47 years, with a mean age of 32 years. Of the 87 patients, 49 (56%) were women and 38 (44%) were men. In the first group, there were 17 (57%) women and 13 (43%) men; in the second group, 18 (60%) women and 12 (40%) men; and in the third group, 16 (60%) women and 11 (40%) men. All selected patients were assessed using the ID Migraine scale, and biochemical blood tests including BDNF-alpha levels were performed.

In the first group (n=30) of patients with episodic migraine, the mean blood BDNF-alpha level was 8.52 ± 1.54 ng/mL. In the second group (n=30) of patients with complicated migraine, the mean BDNF-alpha level was 5.67 ± 1.01 ng/mL. In the third group (n=27) of healthy individuals, the mean BDNF-alpha level was 11.565 ± 1.34 ng/mL (Figure 1).

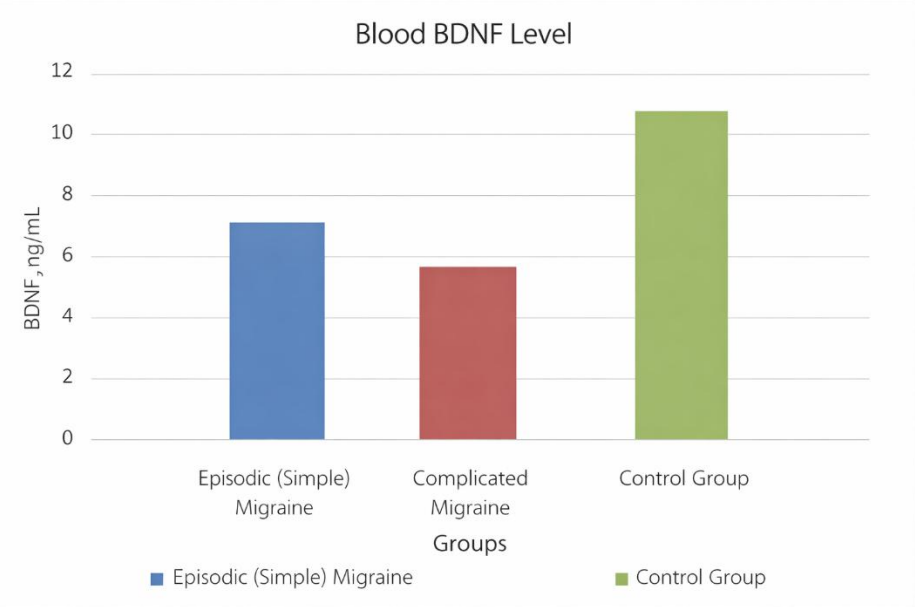
According to the MIDAS scale, in the first group (n=30) with episodic migraine, grade I disability was observed in 10% of patients, grade II in 44%, grade III in 30%, and grade IV in 16%. In the second group (n=30) with complicated migraine, grade I disability was detected in 5%, grade II in 25%, grade III in 40%, and grade IV in 20% of patients. In the third group (n=27), 100% of patients had grade I disability (Table 1).

According to the Visual Analog Scale (VAS), headache intensity was highest in patients with migraine: in group I the mean score was 6.8 ± 0.9 points ($p<0.05$), in group II 7.2 ± 1.5 points ($p<0.01$), and in group III 4.0 ± 1.4 points ($p<0.01$) (Table 1).

According to the ID Migraine scale, in the first group (n=30) episodic migraine had a partial impact on quality of life. In the second group (n=30) with complicated migraine, migraine attacks affected quality of life in 100% of patients. In the third group (n=27), migraine did not affect quality of life in 100% of healthy individuals (Table 1).

Analysis of the Results. Based on the above data, we found that in patients with episodic migraine, blood BDNF-alpha levels were decreased compared to the control group (8.52 ± 1.54 ng/mL; $p<0.05$), while in patients with complicated migraine, a significant decrease was observed ($p<0.01$).

Figure 1.



According to the MIDAS scale, patients in the second group demonstrated a lower quality-of-life score compared to patients in the first group. Assessment using the Visual Analog Scale

(VAS) revealed that patients in the second group experienced very severe headache intensity (7.2 points), whereas patients in the first group had severe headache intensity (6.8 points).

According to the ID Migraine scale, patients in the second group showed a marked reduction in quality of life and work capacity, corresponding to grades IV and V, compared with patients in the first group.

Table 1.

Scale	Episodic (Simple) Migraine	Complicated Migraine	Control Group
MIDAS scale	Grade II	Grade III	Grade I
VAS scale	6.8 ± 0.9 points	7.2 ± 1.5 points	4.0 ± 1.4 points
ID Migraine scale	Grade IV	Grade V	Grade I

In patients with migraine, blood BDNF levels showed a positive correlation with quality of life and a negative correlation between blood BDNF levels, quality of life, and headache intensity.

Conclusion. Patients with complicated migraine demonstrated high-intensity headache according to the VAS scale. A pronounced decrease in quality of life was identified in patients of the second group compared to the first group. A reduction in blood BDNF levels was detected in patients with complicated migraine.

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