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Research report

Cognitive functions and serum levels of brain-derived neurotrophic factor in patients with major depressive disorder

Elif Oral[a,*,1], Serpil Canpolat[b,1], Serap Yildirim[c], Mustafa Gulec[a], Elvin Aliyev[d], Nazan Aydin[a]

[a] Ataturk University, School of Medicine, Department of Psychiatry, 25240 Erzurum, Turkey
[b] Çumra State Hospital, Department of Psychiatry, Turkey
[c] Ataturk University, School of Medicine, Department of Physiology, 25240 Erzurum, Turkey
[d] Ataturk University, School of Medicine, Department of Biochemistry, 25240 Erzurum, Turkey

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ABSTRACT

Objective: We assessed major cognitive domains in major depressive disorder (MDD) compared to a healthy control group using neurocognitive tests. We hypothesized that lower serum brain-derived neurotrophic factor (BDNF) levels would be associated with poorer neurocognitive performance in patients with major depression and that these associations would be shown in healthy controls as well.
Method: Executive functions, sustaining and focusing of attention, memory functions, and verbal fluency were assessed in this study using the Trail-Making Test (TMT), Stroop Color Word Interference Test-TBAG Form (SCWT), Wisconsin Card Sorting Test (WCST), Test of Variables of Attention (TOVA), Auditory Consonant Trigram test (ACTT), Digit Span subtest of the Wechsler Memory Scale (DST), Rey Auditory Verbal Learning Test (RAVLT), and Controlled Oral Word Association Test (COWAT).
Results: The MDD group showed significantly poorer performance than the control group in cognitive functions; they also had lower levels of BDNF than the control group. However, there was no correlation between cognitive performances and BDNF levels except in the TMT, Part B.
Conclusions: The current understanding of the importance of neurocognitive assessment and related biological markers in depression is improving. Further studies with larger sample sizes evaluating neurocognitive functions with molecular analyses of BDNF levels may reveal a novel marker for predicting and monitoring neurocognitive deficits in depression.

1. Introduction

In the community, approximately one in five women and one in eight men experience a major depressive episode during their lifetime [39]. Although it is known that major depression has an episodic course, patients commonly experience a chronic, recurring, and devastating progression [45,56]. Besides mood disturbances, there is some evidence of cognitive impairment in patients with major depression [20,58]. Patients with major depression have significantly higher neurocognitive impairment levels than controls [4,59], although there are some conflicts regarding whether these impairments are a result of medication, anxiety levels, age, or other confounding factors [31,33]. Depression is associated with neuronal atrophy and neuronal cell loss, especially in the hippocampus. The functions of the hippocampus and frontal cortex include learning, memory, and impulse control, all of which relate to the cognitive elements of depressive symptoms, such as hopelessness and suicidality [15,68]. Biological markers may help to explain the origin of multifactorial symptoms, thus enhancing patient-oriented treatment opportunities for depression. The term "biological marker" is used here to describe a biological change associated with depression that could be used to indicate the presence and severity of the condition and predict drug or other treatment response as well as clinical prognosis [55]. Since brain-derived neurotrophic factor (BDNF) was first purified from a pig's brain in 1982, it has been considered the most important of all neurotrophins, which are related to neuronal survival, synaptic signaling, and synaptic integration [8,9,19]. BDNF may play a role in brain plasticity, which is required for healthy modification of the growth and survival of neuron functioning [2,11]. Decreased

Abbreviations: MDD, major depressive disorder; BDNF, brain-derived neurotrophic factor; TMT, Trail-Making Test; SCWT, Stroop Color Word Interference Test-TBAG Form; WCST, Wisconsin Card Sorting Test; TOVA, Test of Variables of Attention; ACTT, Auditory Consonant Trigram test; DST, Digit Span subtest of the Wechsler Memory Scale; RAVLT, Rey Auditory Verbal Learning Test; COWAT, Controlled Oral Word Association Test.

* Corresponding author at: Ataturk University, Medical Faculty, Department of Psychiatry, Yakutiye 25240, Erzurum, Turkey. Tel.: +90 4422316954; fax: +90 4422361301.
E-mail address: oralelif@yahoo.com (E. Oral).

[1] Both the authors contributed equally to this study.

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