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Some characteristics of disorders of cognitive functions in the primary episode of bipolar affective disorder

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ABSTRACT

The problem of bipolar affective disorder (BAD) is one of the central problems of modern psychiatry; one of its key manifestations is impaired cognitive functioning.

The aim of the work was to study the features of cognitive functioning of patients with the primary episode (PE) of BAD, taking into account the gender factor and the clinical type of the primary episode.

Based on examination of 65 men and 88 women with PE of BAD using the Trail Making Test was found in the performance of TMT-A in patients with depressive type of disease pronounced symptoms of cognitive deficits.

In patients with depression the performance of the TMT-B test is significantly worse than the normative ones, in patients with manic type are better, than with depressive, but worse than normal, due to instability of attention. In patients with the mixed type, the TMT-B indexes are similar to those of the patients with the depressive type.

Conclusions. The PE of BAD is accompanied by pronounced manifestations of cognitive deficits in depressive and manic types, and close to normal rates of the TMT test in patients with manic type. In this case, the primary is clinical type of PE, while the impact of gender on cognitive impairment is insignificant.

Keywords: bipolar affective disorder, primary episode, cognitive disorders

INTRODUCTION

One of the most pressing problems of modern psychiatry is BAD, which is accompanied by severe disruption of social functioning, reduced life expectancy, high suicidal activity, involvement in the use of psychoactive substances, and the need for long-term treatment [1-5]. In this case, the timely diagnosis of the disease in the early stages is extremely important for the adequate treatment and rehabilitation of patients with BAD; however, this task presents considerable difficulties due to the lack of research of the initial characteristics of the disease and the low predictive value of existing predictors, which requires the improvement of prodromal identification tools [6]. There is increasing evidence that the nature of future bipolar disorder is due to the nature of the primary or early episodes of the disease; in this case, the features of the PE of BAD are an important factor in predicting the severity of the disease, the functional consequences and the response to treatment; in this case, it may take several years from the first manifestations of the disease to establishing the correct diagnosis [7,8].

Cognitive impairment is an important component of pathological changes in BAD. Bipolar disorder is accompanied by a wide range of cognitive psychopathological phenomena, including disorders of the formal characteristics of thinking and its content, performing functions, attention, and memory [9-11]. At the same time, the characteristics of the cognitive functioning of patients during the PE of BAD have not been studied to date, due to significant methodological and technical difficulties, which significantly complicates the development of treatment, rehabilitation and prophylactic measures for BAD. On this basis, the study of the fea-

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tures of cognitive impairment in patients with PE of BAD is of great scientific and practical importance.

AIM OF THE STUDY

To study the features of cognitive functioning of patients in the PE of BAD, taking into account, the gender factor and the clinical type of the PE.

MATERIALS AND METHODS

With respect to the principles of biomedical ethics based on our informed consent was clinically examined 153 patients (65 men and 88 women) with PE of BAD who were treated in the Ternopil Regional Psychoneurological Hospital during between 2011 and 2016.

The examined men and women were divided into three groups, depending on the clinical type of the course of PE of BAD: with prevalence of depressive symptomatology (depressive type), number 119 people (mean age 21.4 ± 6.4 years (median 19.0 years, interquartile range 17.0-23.0 years), mean age of seeking medical help 21.5 ± 6.4 years (19.0 years, 17.0-23.0 years)): 44 men (mean age, accordingly 20 , 9 ± 6.3 years (18.0 years, 17.0-23.0 years), and 21.0 ± 6.2 years (18.0 years, 17.0-23.5 years)) and 75 women (mean age, accordingly, 21.7 ± 6.5 years (19.0 years, 18.0-23.0 years) and 21.8 ± 6.5 years (19.0 years, 18.0-23.0 years)); with predominance of manic or hypomanic symptoms (manic type), number of 23 persons (mean age, accordingly, 20.5 ± 7.5 years (18.0 years, 17.0-20.0 years), and 20.6 ± 7.6 years (18.0 years, 17.0-20.0 years)): 15 men (mean age, accordingly, 19.2 ± 3.8 years (18.0 years, 17.0-20.0 years) and 19, 2 ± 3.8 years (18.0 years, 17.0-20.0 years)) and 8 women (mean age, accordingly, 23.1 ± 11.8 years (19.5 years, 18.5-20.5) years) and 23,1 ± 11,8 years (19,5 years, 18,5-20,5 years)), with simultaneous presence of depressive and manic symptoms or with rapid phase change (mixed type), 11 patients (average age 21,4 ± 5,4 years (19.0 years, 18,0-26,0 years) and 21,6 ± 5,2 years (19.0 years, 18,0-26,0 years)): 6 men (mean age, accordingly 20.8 ± 6.7 years (18.5 years, 17.0-21.0 years) and 21.2 ± 6.4 years (18.5 years, 18.0-21.0 years)) and 5 women (mean age, accordingly, 22.2 ± 4.0 years (20.0 years, 19.0-26.0 years) and 22.2 ± 4.0 years (20.0 years, 19,0-26,0 years)).

Cognitive functions were studied using the Trail Making Test (TMT) Parts A and B [12]. Part A included the task of connecting the points (25 points) as quickly as possible, and part B of the task was connecting the numbers and letters in the correct order. The test results were recorded with a stopwatch to the nearest 0.1 s.

Statistical analysis was performed using non-parametric Mann-Whitney U test. The level of statistical significance of differences over 95.0% ($p < 0.05$) was considered acceptable.

RESULTS

The study of the features of cognitive processing of information and cognitive processes (flexibility of thinking, working memory, attention control and inhibition) using the TMT test revealed a number of patterns.

When performing the first part of the test (TMT-A), patients with the depressive type of PE of BAD showed pronounced phenomena of cognitive deficiency (Fig. 1). The average time to perform the TMT-A test was 93.3 ± 11.5 sec. (median 90.0 sec., interquartile range 85.0–99.0 sec. in all patients, 94.8 ± 13.7 sec. (90.5 sec. / 85.0–100.0 sec.) in males and 92.5 ± 9.9 sec (90.0 sec / 85.0–99.0 sec) in females; the differences between males and females are statistically insignificant ($p>0.05$), three times higher. Significant increase in the timing of the TMT-A test in patients with depressive type of PE of BAD is associated with a pronounced slowing of the speed of mental processes during the depressive state, as well as a decrease in switching attention due to bradipsychism. Patients with depressive type of PE of BAD while performing the TMT-A test also made errors, which also affected the speed of the test.

In contrast, in patients with a manic type of PE of BAD, test performance was close to normal. The average value of the test in all patients was 29.9 ± 4.2 sec. (29.0 sec. / 26.0-33.0 sec.), In men 30.6 ± 4.0 sec. (31.0 sec. / 27.0-34.0 sec.), In women 28.5 ± 4.4 sec. (26.0 sec. / 25.5-31.5 sec.) The differences between men and women are statistically insignificant ($p > 0.05$). Analyzing these data, it should be noted that the speed of test execution in patients with a manic type of PE of BAD was extremely high due to the inherent manic condition of general acceleration of mental and motor activity, however, these patients made a significant number of errors associated with the inability to prolonged concentration and its scattering, which affected the overall test result.

In patients with mixed type of PE of BAD, the TMT-A test scores were more similar to those found in patients with depressed PE of BAD. At the

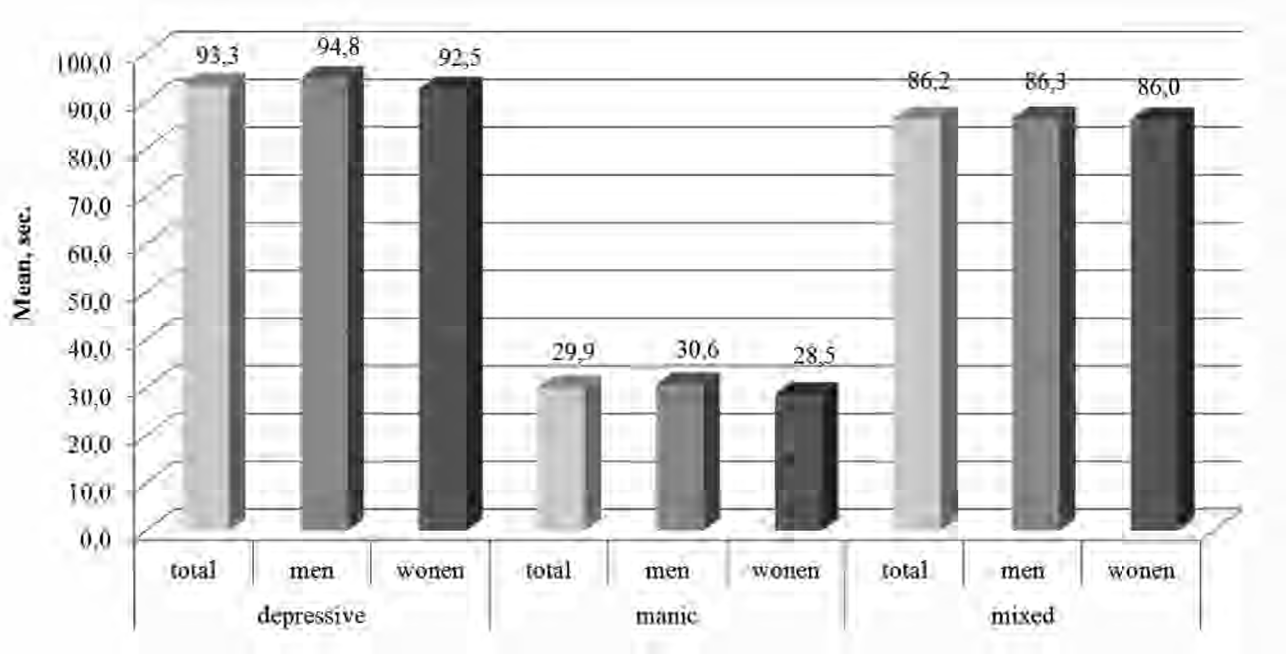

FIGURE 1. *Average performance of the TMT-A test (in seconds) in patients with different types of PE of BAD*

same time, this group is heterogeneous in affective symptoms, which is reflected in the features of the test. The mean time of the TMT-A test in all patients with mixed PE of BAD was 86.2 ± 10.4 sec. (88.0 sec. / 76.0-96.0 sec.), in men 86.3 ± 11.9 sec. (88.0 sec. / 73.0-96.0 sec.), in women 86.0 ± 9.6 sec. (88.0 sec. / 77.0-90.0 sec.). The differences in the timing of the TMT-A test between men and women were statistically insignificant ($p > 0.05$).

When comparing groups with different types of PE of BAD in terms of performance of the TMT-A test, statistically significant differences were found between groups with depressive and manic variants of PE of BAD for all patients ($p < 0.01$), for men ($p < 0.01$) and for women ($p < 0.01$), and when comparing groups with manic and mixed types of PE of BAD for all patients ($p<0.01$), for men ($p<0.01$), and for women ($p< 0.01$). The differences between the groups of patients with depressed and mixed types of PE of BAD for all patients, for men and for women, were not statistically insignificant ($p > 0.05$).

The above patterns are generally preserved when performing the second part of the test TMT (TMT-B), however, with some differences revealed.

In patients with depressive type of PE of BAD, the performance of the TMT-B test is significantly worse than the normative one (Fig. 2). The mean value of the test in all patients with depressive type of PE of BAD was 315.2 ± 23.5 sec. (median 318.0 sec., interquartile range 298.0–329.0 sec.), males 316.8 ± 26.4 sec. (319.0 sec. / 292.5–331.5 sec.), in women - 314.3 ± 21.8 sec. (317.0 sec. / 298.0-328.0 sec.). Such low rates naturally reflect the high level of inhibition, rigidity of thinking, exhaustion associated with the depressive state. The differences in the performance of the TMT-B test between men and women were statistically insignificant ($p > 0.05$).

The performance of the TMT-B test in patients with the manic type of PE of BAD is significantly better than in patients with the depressive type of PE of BAD, but, unlike the indicators of TMT-A, is significantly worse than normal. Thus, the average value of the TMT-B test in all patients with manic type was 145.7 ± 10.4 sec. (144.0 sec. / 141.0-147.0 sec.), in men 144.1 ± 3.9 sec. (144.0 sec. / 142.0-147.0 sec.), in women - 148.6 ± 17.1 sec. (142.5 sec. / 140.0-148.0 sec.). The differences between men and women are statistically insignificant ($p>0.05$). Poor performance of the TMT-B test compared to the TMT-A in patients with the manic variant of PE of BAD is associated with the greater complexity of the TMT-B, which requires a high level of control and flexibility of attention, the ability for long-term concentration of attention, effective working memory. Patients with a manic type of PE of BAD had a high mechanical speed of test execution with a significant number of errors, which was reflected in the final result. It should be noted that when performing the test in patients with a manic type of PE of BAD, there was a rapid increase in the number of errors: if in the first 10-20

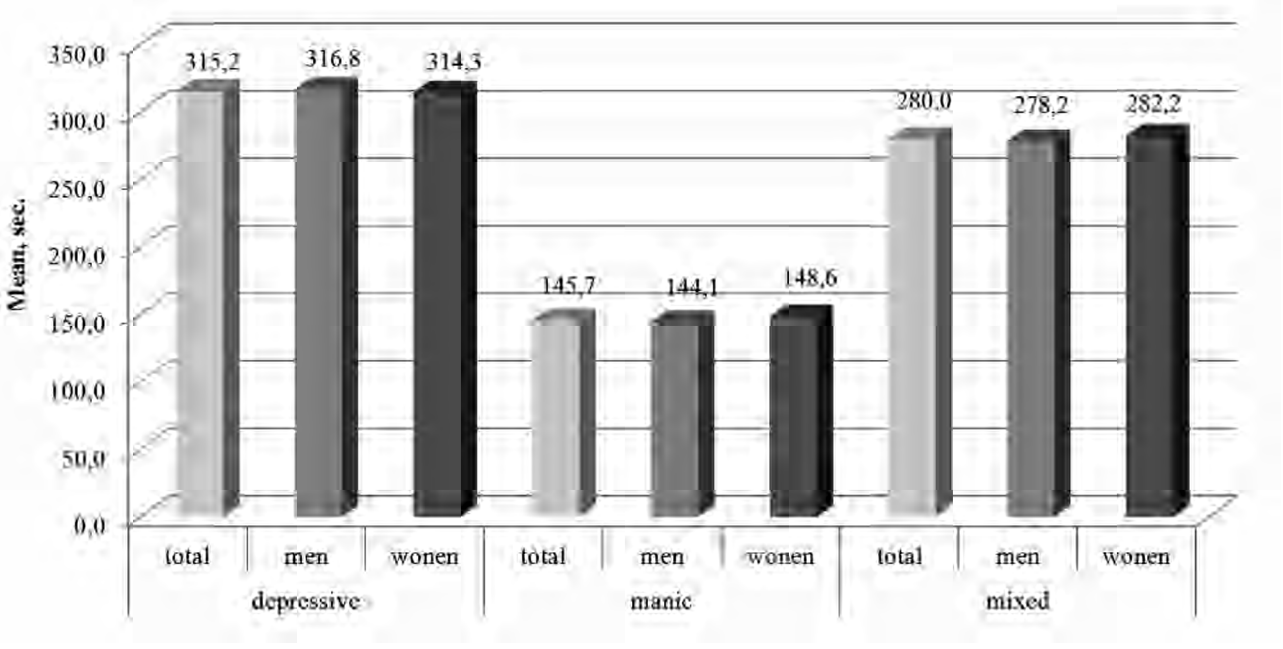

FIGURE 2. *Average performance of the TMT-B test (in seconds) in patients with different types of PE of BAD*

seconds the test was performed almost unmistakably, then as the number of errors increased rapidly, reaching a maximum in its last parts. Such manifestations reflect the difficulty of fixing attention, the rapid dispersion of it, the difficulty of prolonged concentration on tasks, inherent in patients in a manic state.

In patients with mixed type of PE of BAD, the performance of the test TMT-B, as well as TMT-A, are more similar to those inherent in patients with depression. Thus, the average time of the TMT-B test in all patients with mixed type of PE of BAD was 280.0 ± 7.4 sec. (280.0 sec. / 273.0–286.0 sec.), in men 278.2 ± 8.2 sec. (276.5 sec. / 271.0–282.0 sec.), in women 282.2 ± 6.5 sec. (284.0 sec. / 276.0–286.0 sec.). The differences between men and women are statistically insignificant ($p > 0.05$).

When comparing groups with different debut types of PE of BAD, significant differences in TMT-B scores were found for the depressive and manic variants when comparing all patients ($p<0.01$), men ($p<0.01$), and women ($p<0.01$); for the depressed and mixed types, when comparing all patients ($p<0.01$), men ($p<0.01$) and women ($p<0.01$); for manic and mixed types - when comparing all patients ($p<0.01$), men ($p<0.01$) and women ($p<0.01$).

DISCUSSION

The data obtained in our study are consistent and complementary to some similar studies. Thus, in the study of Y. Zhu et al. (2019) found an increase in the time of perform the TMT test in patients with BAD and major depressive disorder; in this case, the data on the quantitative characteristics of TMT-A are in general likely with the data received in our study for all patients with all clinical variants of PE of BAD [13], and are consistent with the data of Mar Bonnin et al. (2019) regarding worse performance according to the TMT test in patients with BAR [14]. At the same time, the selection of the depressive, manic and mixed types of PE of BAD allowed us to show that the quantitative characteristics of TMT differ significantly depending on the clinical variant of PE, and it should be taken into account when assessing the cognitive functions of patients with PE of BAD. Our findings on early-stage cognitive impairment are an important complement to the data of A. Ratheesh et al. (2013) [15], who report significantly lower rates of subtests A and B in 16 children who developed BAD over an 8-year follow-up compared to those who did not develop BAD; thus, cognitive impairment, such as impaired executive function and visual-spatial abilities can be used as predictors of BAD at the pre-nosological and early nosological levels. The study of Lima I.M., Peckham A.D. and Johnson S.L. (2018) [16] highlighted that the most studied today is the state of executive functions, which includes three main functions: inhibition – the ability to suppress irrelevant information to achieve the goal, working memory - the ability to retain and manage information, and cognitive flex-

ibility – the ability change strategies in response to feedback; all these functions in patients with BAD are significantly impaired, what is confirmed in our study. The data obtained by us also coincide with the results obtained by S. Bourne et al. (2013), who report the presence of cognitive impairment in BAD patients based on the analysis of TMT test data; the authors consider TMT as a reliable tool for detecting cognitive impairment in patients with BAD [17]. Many researchers give information regarding the presence of performance deficits, based on neuropsychological tests in BAD patients (T. Sparding (2015) [18], R. Paunescu, J. Miclutia (2015) [19], L. Weiner et al. (2019) [20]), however, the peculiarity of our study is to study the features of cognitive disorders based on neuropsychological tests in patients with depressive, manic and mixed types of the PE of BAD, which revealed quantitative and qualitative differences in characteristics of cognitive dysfunction taking into account the clinical type of the disease debut.

CONCLUSIONS

The PE of BAD is accompanied by marked disorders of cognitive functioning.

Patients with a depressive type of PE of BAD revealed pronounced phenomena of cognitive deficiency due to bradipsychism, performance of TMT tests in patients with a manic type are close to normal, and patients with a mixed type have found patterns close to the depressive type.

The determining factor in the characteristics of cognitive impairment in the PE of BAD is its clinical type; the impact of gender on cognitive impairment is insignificant.

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