Assessment of Cognitive Functions in Bipolar Disorder Patients

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Abstract:

Bipolar disorders are chronic disorders with a high relapse rate; the lifetime prevalence is approximately 4%. Bipolar patients may experience cognitive impairment at various phases of the illness, even during the euthymic phase of the disease.

Aims: To assess cognitive abilities in individuals with bipolar 1 disorder during remission and to investigate the correlation between cognitive functions and the clinical profile and demographic characteristics of the patients.

Setting and Design: This is a case-control study involving patients diagnosed with bipolar 1 disorder in the euthymic phase, as per DSM-5 diagnostic criteria.

Patients and methods: This study included 36 bipolar 1 disorder patients in the euthymic phase diagnosed according to DSM-5 diagnostic criteria. Also, it included 36 cross-matched healthy individuals as control subjects.

Results: Patients with bipolar1 disorder demonstrated considerably lesser cognitive functions during remission than the control group. The bipolr1 disorder severity and recurrence are significantly inversely correlated to cognitive function.

Conclusion: Bipolar1 disorder patients frequently have cognitive impairment at all phases of the illness, even during euthymia. Cognitive impairment is frequently seen as a fundamental feature of bipolar disorder. The severity and recurrence of the illness appear to play a key influence in cognitive impairments.

Keywords: Bipolar Disorder, Cognition, Cognitive Assessment

Introduction

Bipolar disorder is a chronic disorder that causes considerable overall disability, personal and societal stress, and psychological impairment. Despite medication, these impairments frequently remain (1).

Lifelong prevalence of bipolar disorder is about 4%. Both men and women are equally at risk. On the other hand, women are more likely to have multiple mood episodes per year (rapid cycling). Bipolar disorder usually begins around age 25 (2).

Data from various meta-analyses reveal that the majority of bipolar disorder patients have neurocognitive impairment, even during euthymia. Attention, verbal and learning memory, and executive functioning are the areas most affected, with impact sizes ranging from medium to high, but premorbid intellectual abilities appear intact (3). The severity of the illness plays a significant effect on cognitive abnormalities. (4,5) A negative link exists between a severe course of bipolar disorder (early onset, greater disease duration, and a larger number of hospitalizations) and cognitive function (6). severe bipolar disorder patients experience significant cognitive impairment (6,7,8).

Increasing evidence shows that many cognitive areas are affected even during the euthymic

phase. Evidence suggests that euthymic bipolar individuals have a cognitive function deficit (9).

Cognitive impairment must be regarded as a key component of bipolar disease, influencing remission and overall functioning (6).

Patients and Methods

This study is a case-control study involving 72 people, divided into 36 euthymic bipolar 1 disorder patients, who met the diagnostic criteria for DSM-5 (6 months of remission are needed, Hamilton-Depression Rating scale (HAM-D≤8), Young Mania Rating Scale (YMRS≤6)), (22 male and 14 female), who attended the Assiut University Hospitals outpatient psychiatry clinics. These patients were between 18 and 55 and had attended the clinics for follow-up of their illnesses. Compared to 36 healthy volunteers with no neurological or psychiatric disorders history, relatives of patients, staff, and employees at Assiut University hospitals (18 males; 18 females). The Montreal Cognitive Assessment Scale (MOCA) was used to assess the cognitive function of both groups, evaluating the severity of previous episodes using the HAM-D Scale and YMRS.

All participants signed informed consent.
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Methods

During enrolment in the study, each participant underwent an individual, standardized psychiatric interview (in accordance with the DSM-5) and provided a complete medical history. The history contained specific information regarding the duration of illness in years, the number of episodes, the type of attacks, family history of psychiatric illness, the existence of medical conditions, and the presence of drug or alcohol addiction.

A general and routine neurological examination was performed on everyone. The 36 patients with bipolar 1 disorder (euthymic) met the DSM-5 diagnostic criteria for bipolar 1 disorder, were in remission, and their episode severity was evaluated using the HDRS (17-item) and the Young Mania Rating Scale**.**

-(HAM-D, 17-item) the Arabic version of the Hamilton Depression Rating Scale (10)(11) The original version of the questionnaire (HAM-D17) had 17 items on signs of depression. Each version has a different system for scoring. A score of 20 or more is typically necessary to be included in the study, while a score of 0-7 on the HDRS17 is typically deemed within the normal range (in remission). Hamilton's checklist of symptoms of Depressive illness (HAM-D) version utilized in this study was translated into Arabic by Lotfy Faheem.

-The Young Mania Rating Scale(12)(13) (14) One of the most popular rating measures for evaluating symptoms of mania is the Young Manic Rating Scale (YMRS). The patients subjectively assessed their clinical condition, which was the basis for the 11-item scale.
Irritability, speech, thought content, and disruptive/aggressive behavior are scored on a 0–8 scale; the other seven items are graded on a 0–4 scale. Each level of severity has well-described anchor points.
Baseline scores for the YMRS might vary greatly. Depending on the clinical features of the patient, such as mania (YMRS = 12), depression (YMRS = 3), or euthymia (YMRS = 2).
-The **MoCA (Montreal Cognitive Assessment Test)** assesses cognitive function in both groups**.** A one-page, 30-point test with a 10-minute administration time is used (15). The MoCA evaluates various cognitive areas, including two attempts to learn five nouns for **short-term memory** recall tasks (5 points), and the delayed recall occurs after about five minutes.

A clock drawing task (3 points) and a 3D cube version (1 point) are used to assess visuospatial ability. A modified B-test alternation task (1 point), a vocal fluency task (1 point), and a two-component verbal abstraction task (2 points) are used to assess different components of executive function.

Using a sustained attention task (target detection by clicking; 1 point), a sequential subtraction problem (3 points), and digit forward and backwards (1 point each), attention, concentration, and working memory were assessed.

A three-item confrontation is used to evaluate **language**. Three points are awarded for **naming** a low-familiarity animal (a lion, a camel, or a rhinoceros), two points are awarded for repeating two syntactically challenging lines, and one point is awarded for fluency. A characterization similarity exercise is used to evaluate **abstract reasoning**; two points are available. Finally, the participant is questioned about the date and location of the test to assess **orientation** to time and place (6 points).

Ratings of MoCA vary from 0 to 30. (16) Normal score is typically 26 or higher, and research validating the MoCA test conducted by Nasreddin in 2005 showed that MoCA was a potential tool for diagnosing mild cognitive impairment (MCI) and impairment of early cognitive Alzheimer's disease (17). Validation research found that MoCA has a sensitivity of 90% and a specificity of 87% for detecting mild cognitive impairment. Compared to the MMSE's 18% and 100%. Even though they were generally better than the MMSE, later research in different contexts showed less promise (18).

Statistical Analysis

Data was analyzed using SPSS (Statistical Package for the Social Sciences, version 20, IBM, Armonk, New York). Mean and standard deviation (SD) are used to express quantitative data and are compared using the Student's t-test or ANOVA test. Nominal data are represented by frequency and percentages (%). This data has undergone a Chi^2 test.

Pearson correlation was used to identify the correlation between MCA and its various domains with other parameters. The confidence level was maintained at 95%, and a P value of less than 0.05 was considered significant.

Results

Demographic Data of Studied Groups (Table 1):

The mean age of the patient group was 30.86 ± 6.86 years, compared to 28.50 ± 6.39 years for the control group.

There were no statistically significant variations between the two groups' baseline characteristics ($p> 0.05$); however, the patients' group had statistically significantly higher rates of positive family history of bipolar mood disorders (16 (44.4%) vs. 2 (5.6%); p 0.001).

Clinical Profile of Patients group (n= 36) (Table 2):

It was found that attacks of mania/depression occurred in 29 (80.6%) patients, while attacks of mania/depression with mixed features occurred in 7 (19.4%) patients. 32 (88.9%) patients completely improved between the attacks. It was found that the range of attack ranged between once and 30 times, with the mean number being 4.83± 2.61 times.

Attack duration ranged between 12.68 ± 9.84 months with a range between two and 48 months. Also, the frequency of hospitalization ranged between once and 19 times, with a mean number of hospitalizations of 3.31 ± 3.21 times. The mean duration of chronicity was 4.75 ± 3.15 years, ranging between one and 19 years.

Montreal Cognitive Assessment Among Studied Group (Table 3) (Figure 1): Compared to the control group, the patient

group demonstrated statistically significant lower executive function, attention, language, abstraction, delayed recall, and orientation, as well as a lower total MoCA mean (P-value < 0.05), whereas naming showed no difference (P-value > 0.05).

Correlation Between Number of Episodes and Inter-episodic Periods to MOCA (Table 4) (Figure 2): It was found that the number of attacks had a negative correlation with visuospatial, attention, delayed recall, and total MoCA (*p-value* < 0.05). All other correlations with other domains were insignificant differences (*p*> 0.05). Also, MoCA and its different domains had insignificant correlations with duration between attacks.

Correlation Between Duration of Illness and Cognitive Function (Table 5) (Figure 3): Visuospatial, attention, delayed recall, orientation, and total MOCA all had a significantly negative connection with hospitalization frequency and length of illness (chronicity) (p-value< 0.05). The correlation between other dimensions and hospitalization frequency and chronicity was negligible.

Table 1: Demographic characteristics of studied groups

	Patients group (n= 36)	**Control group (n= 36)**	***P* value**
Age (years)	30.86 ± 6.86	28.50 ± 6.39	0.13
Sex Male Female	 22 (61.1%) `4 (38.9%)	 18 (50%) 18 (50%)	0.23
Occupation Working Not working	 28 (77.8%) 8 (22.2%)	 29 (80.6%) 7 (19.4%)	0.50
Education years > 12 years < 12 years	 20 (55.6%) 16 (44.4%)	 22 (61.1%) 14 (38.9%)	0.40
Special habits Yes No	 14 (38.9%) 22 (61.1%)	 15 (41.7%) 21 (58.3%)	0.50
Residence Urban Rural	 9 (25%) 27 (75%)	 6 (16.7%) 30 (83.3%)	0.28
Marital status Married Single Divorced Widow	 20 (55.6%) 13 (36.1%) 3 (8.3%) 0	 25 (69.4%) 8 (22.2%) 1 (2.7%) 2 (5.6%)	0.06
GMC No GMC	2 (5.6%) 34(94.5%)	4 (11.1%) 32(88.9%)	0.33
SUD No SUD	6 (16.7%) 30(83.4%)	0 36(100%)	**0.01**
Family history No Family history	16 (44.4%) 20(55.6%)	2 (5.6%) 34(94.5%)	**< 0.001**

Data is expressed as mean (SD) and frequency (percentage). *P-value* was significant if < 0.05. **GMC:** general medical condition: **SUD:** substance use disorders.

Table 2: Clinical profile of patients group

	Patients group (n= 36)
Number of attacks Range	4.83 ± 2.61 1-30
Type of attacks Mania/Depression Mania/Depression with mixed feature	 29 (80.6%) 7 (19.4%)
The duration between attacks (months) Range	12.68 ± 9.84 2-48
Hospitalization Range	3.31 ± 3.21 1-19
ECT Range	17.72 ± 15.80 4-76
Last ECT (month) Range	9.11 ± 3.34 3-60
Chronicity (years) Range	4.75 ± 3.15 1-19

Data is expressed as mean (SD), range, and frequency (percentage). ECT: electroconvulsive therapy

Table 3: Mean score of Montreal cognitive assessment among studied groups

	Patients group (n= 36)	Control group (n= 36)	*P* value
Visuospatial	4.69 ± 0.53	4.71 ± 0.87	< 0.001
Naming	2.29 ± 0.28	2.94 ± 0.23	0.64
Attention	4.19 ± 1.14	5.78 ± 0.49	< 0.001
Language	2.67 ± 0.54	2.94 ± 0.34	0.01
Abstraction	1.92 ± 0.28	2.06 ± 0.23	0.02
Delayed recall	2.19 ± 1.06	2.89 ± 1.23	0.01
Orientation	5.50 ± 0.77	6	< 0.001
Total MOCA score	23.75 ± 3.23	27.44 ± 1.29	< 0.001

Data is expressed as mean (SD) and frequency (percentage). *P-value* was significant if < 0.05. MOCA: Montreal cognitive assessment

Table 4: Correlation of the number of episodes and inter-episodic periods with MoCA.

	Number of attacks		Duration between attacks	
	***r* value**	***P-value***	***r* value**	***P-value***
Visuospatial	-0.43	0.01	0.14	0.43
Naming	0.02	0.87	-0.14	0.43
Attention	-0.43	0.01	0.04	0.83
Language	-0.06	0.70	-0.20	0.26
Abstraction	0.09	0.95	0.07	0.69
Delayed recall	-0.48	< 0.001	0.06	0.72
Orientation	-0.40	0.01	0.12	0.51
MOCA	-0.53	< 0.001	0.10	0.59

Data expressed as *r*-value (strength of correlation) and *p-value* (significance of the correlation was significant if < 0.05). **MOCA**: Montreal cognitive assessment.

Table 5: Correlation between Duration of illness with MOCA

	Hospitalization		Chronicity	
	***r* value**	***P-value***	***r* value**	***P-value***
Visuospatial	-0.44	< 0.001	-0.44	< 0.001
Naming	-0.03	0.98	-0.06	0.69
Attention	-0.38	0.02	-0.43	< 0.001
Language	-0.10	0.56	-0.12	0.45
Abstraction	-0.03	0.85	0.01	0.94
Delayed recall	-0.43	< 0.001	-0.47	< 0.001
Orientation	-0.41	0.01	-0.45	< 0.001
Total MOCA score	-0.53	< 0.001	-0.59	< 0.001

Data expressed as *r* value (strength of correlation), *p-value* (significance of correlation wand was significant if < 0.05). **MOCA**: Montreal cognitive assessment

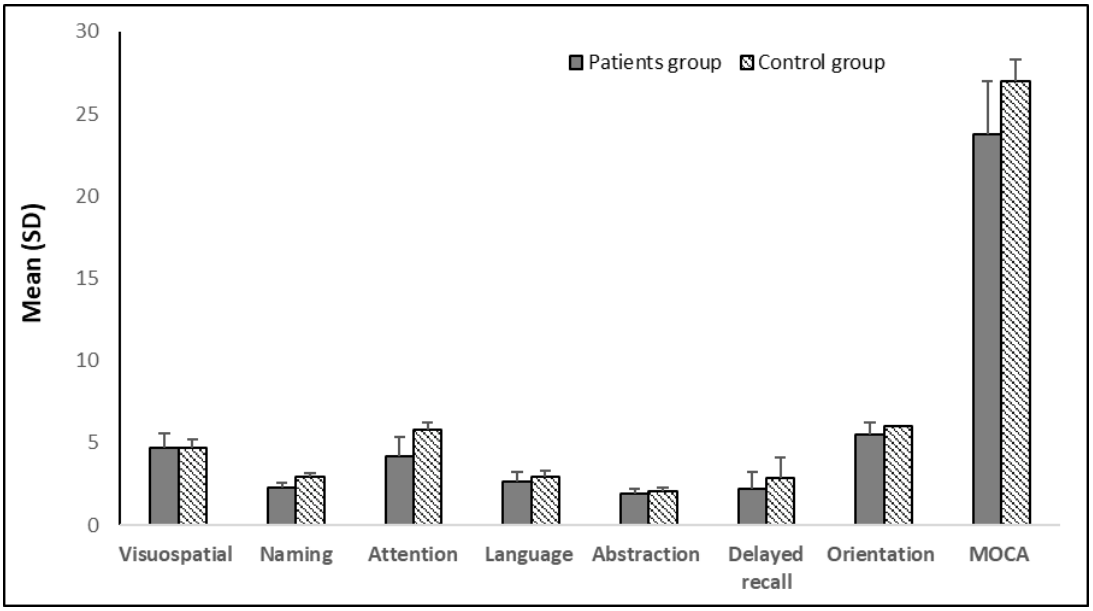

Figure 1: Mean score of Montreal cognitive assessment among studied groups

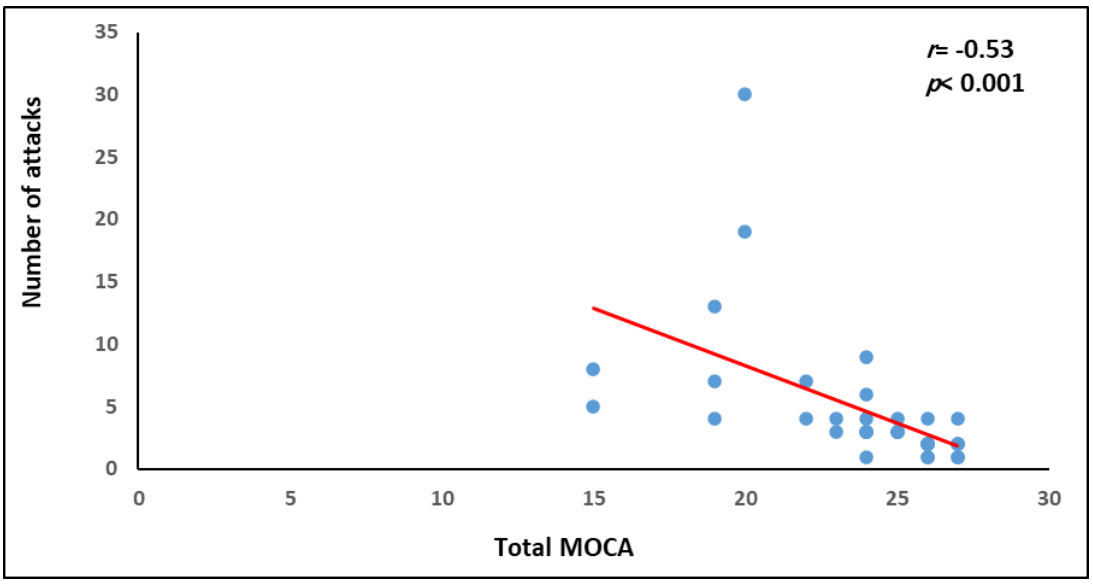

Figure 2: Correlation between total MOCA and number of episodes

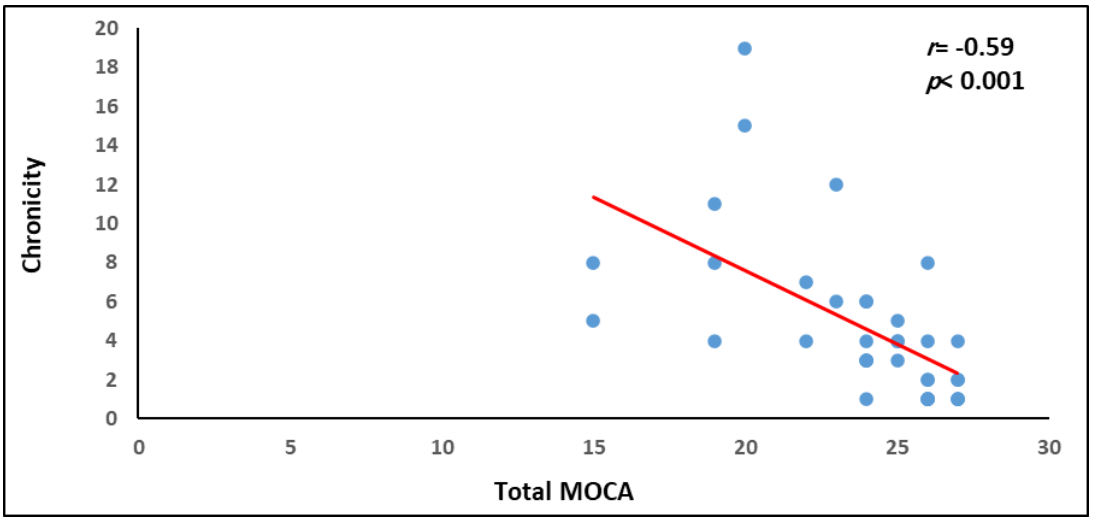

Figure 3: Duration of illness and total MoCA

Discussion

In this study, there were no statistically significant variations in age, gender, education, occupation, and marital status between the sick and control groups. ($p>0.05$).

In most cognitive domains, the bipolar individuals performed less than the control group. Compared to the control group, the patient group performs Less in executive function, attention, language, abstraction, delayed recall, and orientation. Additionally, compared to the control group, the sick group's total MOCA score (a cognitive function measure) was considerably lower. According to that study, compared to control subjects, people who experienced just one manic episode performed worse on attention, executive function, and general memory tests. These cognitive abnormalities may be phenotypic indicators for the illness because they are present from the first episode in bipolar patients and remain present even when the patient is in remission. This conclusion is consistent with (6,19). These findings from earlier studies also highlight weaknesses like executive function (21) and attention (20), which persist in acute and euthymia. (22)(23)

Consistent with our work (24), another study (25) showed that bipolar patients show persistent attention impairment whether they are assessed during mania or depression and that the observed impairment does not completely go away after euthymia. Additionally, (20) found that euthymic bipolar illness patients had a more widespread pattern of attentional impairment than did the healthy group. According to data from different sources, cognitive abnormalities are obvious early in the illness (26). This supports the idea that BD (27) may have a phenotypic marker for cognitive impairment.

This study demonstrated a negative link between the number of attacks and the MOCA total score, attention, visuospatial, and delayed recall. All other relationships (naming-language-abstraction) with other domains were negligible ($p> 0.05$). This is in line with the findings of (8), (7), and (28), who linked greater cognitive impairment to a larger frequency of episodes. This conclusion is consistent with (3).

Contrary to this study (29), which shows a negligible association between attention and the number of episodes, these discrepancies can be accounted for by the small sample size and subjective scale evaluations.

In this study, there was a strong negative connection between visuospatial, attention, delayed recall, orientation, and total MOCA scores with the length of illness (chronicity) and frequency of hospitalization. The connection between chronicity and other domains (naming-abstraction) was negligible (P-value>.05). Similar to (30) (31)(32), it has been discovered that executive functions are negatively impacted (7). Additionally, this conclusion concurs with (6).

These cognitive abnormalities may be phenotypic indicators of the illness because they persist in the first episode and even when the patient is in remission (6).
This investigation supports the findings of other studies showing that patients with more severe past illnesses, more episodes, and more frequent hospitalizations experience greater neurocognitive impairment (7) (33).

Conclusion

Even when the condition is in remission (euthymic patients), bipolar 1 disorder patients frequently experience "debilitating" cognitive impairment in areas like attention, memory, and executive function. Deterioration of cognitive function is frequently seen as a fundamental feature of this psychiatric disease. Regarding cognitive deficiencies, the severity and recurrence of the disorder appear to be key factors.

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Conflicts of interest
None declared.

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