Original Research Article

A prospective study of cognitive functioning in bipolar disorders in a tertiary care hospital

Rajarshi Guha Thakurta[1*], Ananta Manna[2], Kaberi Bhattacharyya[3], Soumendu Sen[4]

[1]Assistant Professor, Department of Psychiatry, Midnapore Medical College and Hospital, Midnapore, West Bengal, India
[2]Senior Resident, Department of Psychiatry, Midnapore Medical College and Hospital, Midnapore, West Bengal, India
[3]Associate Professor, Department of Psychiatry, Midnapore Medical College and Hospital, Midnapore, West Bengal, India
[4]Senior Resident, Department of Psychiatry, Midnapore Medical College and Hospital, Midnapore, West Bengal, India

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Abstract

Introduction: Bipolar disorder (BD) is characterized by episodic pathological mood alterations that can be manic, depressive or mixed [American Psychiatric Association, 1994]. In the last 10 years, there has been increased emphasis on the role of cognition in BD attested by the exponential growth in the number of relevant publications. A significant turning point was the realization that cognitive impairment was a replicable feature of BD with measurable changes being present both during episodes and in remission. **Materials and methods: Study Design:** A prospective comparative study was conducted at the Department of Psychiatry, Midnapore Medical College and Hospital, Midnapore, West Bengal for 1 year , Institutional ethical clearance was taken**.** 100 patients suffering from bipolar disorder I currently in remission and 100 healthy controls were included in this study. The clinical state of individuals was assessed by a psychiatrist using a semi-structured proforma for documentation which included socio-demographic data of the patient, history of psychological symptoms, and thorough Physical examination findings. 100 patients were selected for the study, which fulfilled the DSM-IV TR criteria for Bipolar disorder I. Remission was assessed with scores 8 or less on Hamilton Depression Rating Scale (H.D.R.S.) and 6 or less on Young's Mania Rating Scale (Y.M.R.S.). **Results:** Patients with bipolar I disorder were found more cognitively impaired in comparison to the control group particularly in attention, working memory, and executive functioning. Factors affecting neurocognitive performances were early-onset, age, duration of illness and number of episodes. **Conclusion:** Cognitive functioning of an individual is very important as it not only reflects a patient's socio-occupational functioning and ability to live independently but also about the insight of their illness and compliance to treatment. Adequate cognitive remediation at an early stage of illness might improve the outcome of bipolar illness. Therefore, the development of interventions targeting cognitive impairments is imperative for improving recovery rates and quality of life in patients suffering from bipolar disorder.

Key Words: Bipolar disorder, Hamilton Depression Rating Scale, Young's Mania Rating Scale, Cognitive function.

Introduction

Bipolar disorder (BD) is characterized by episodic pathological mood alterations that can be manic, depressive or mixed [American Psychiatric Association, 1994]. In the last 10 years, there has been increased emphasis on the role of cognition in BD attested by the exponential growth in the number of relevant publications[1]. A significant turning point was the realization that cognitive impairment was a replicable feature of BD with measurable changes being present both during morbid episodes and in remission[2].Increased morbidity and mortality in bipolar disorder is due to fact that a significant proportion of bipolar patients do not receive optimal treatment for their illness for a variety of reasons[3]. Sixty-nine per cent of patients reported having been misdiagnosed. Bipolar patients suffer from mood symptoms for an average of 8-10 years of waiting period before receiving a correct diagnosis. Compliance is a major issue at any given time. Only 50% of the patients receive treatment and out of this, about one-third of patients do not adhere to the treatment regimen, thus limiting the potential benefits of treatment[4].

Cognitive dysfunctions are peculiar characteristics in bipolar disorder, particularly executive functioning (e.g. Inhibitory control), attention, processing speed, verbal learning and declarative memory. All patients show clinical recovery in between affective episodes but only about one-third recovers functionally during the same period[5]. Cognitive impairment in mood disorders influences an individual's occupational functioning and thus hampers the ability to maintain a normal social life. It also affects the patient's insight, impairs compliance to the treatment, which may lead to further relapses. Better neurocognitive functioning improves chances of recovery. Therefore, even after adequate symptom control, there is an intense need of developing interventions targeting cognitive impairments for improving recovery rates and quality of life in patients with bipolar disorder. The studies on neurocognitive deficits are mostly done in patients suffering from schizophrenia. There are very few studies about the neurocognitive deficit in patients with bipolar disorder, especially in the Indian population[6]. Various studies have been conducted but most of them lacked comprehensible neuropsychological battery, there was no distinction between unipolar and bipolar states did not have control of mood state at the time of the study. To address these issues, we have undertaken the present study, wherein we have compared neurocognitive functions in a group of euthymic patients with Bipolar I Disorder, and a control group, on a battery of tests (Mini-Mental Status Examination, Frontal Assessment Battery, Trail Making Test A and B). As there are very few studies aimed at the impairment of cognitive functioning in patients with

*Correspondence
Dr. Rajarshi Guha Thakurta
Assistant Professor, Department of Psychiatry, Midnapore Medical College and Hospital, Midnapore, West Bengal, India
E-mail: rajarshiguha1982@gmail.com

bipolar disorder in the Indian population particularly in rural areas we undertook this study. The study was done after obtaining the Institutional ethical clearance.

Materials and methods

Study Design

A prospective comparative study.

Study location

Department of Psychiatry, Midnapore Medical College and Hospital, Midnapore, West Bengal.

Study duration

1 year

100 patients suffering from bipolar disorder I currently in remission and 100 healthy controls were included in this study.

Clinical Assessment

Clinical state of individuals was assessed by a psychiatrist using a semi-structured proforma for documenting which included socio-demographic data of the patient, history of psychological symptoms, and thorough Physical examination findings. 100 patients were selected for the study, which fulfilled the DSM-IV TR criteria for Bipolar disorder I. Remission was assessed with scores 8 or less on Hamilton Depression Rating Scale (H.D.R.S.) and 6 or less on Young's Mania Rating Scale (Y.M.R.S.).

Inclusion criteria

Age 17-65 years, literate, euthymic at the time of the interview, fulfilling DSM IV-TR criteria of bipolar I disorder, gave formal consent.

Exclusion criteria

Patients with coexisting other Psychiatric or neurological illnesses were excluded from the study.

Neurocognitive Battery (Mini-Mental Status Examination (M.M.S.E.), Frontal Assessment Battery (F.A.B.), Trail Making Test) were administered to bipolar I euthymic patients and were compared with 100 healthy controls.

Neuropsychological Measures

Following Neurocognitive Battery scales were used to find out the neurocognitive profile of the patient. The task was given in the same order as the whole sample.

a) Mini-Mental Status Examination (M.M.S.E.): To assess overall neurocognitive function and the severity of cognitive impairment at a given point in time and to follow the course of cognitive changes in an individual over time, thus making it an effective way to document an individual's response to treatment.

b) Frontal Assessment Battery: This is a bedside battery to assess the prevalence and severity of a dysexecutive syndrome affecting both cognition and motor behaviour. It consists of six subsets (score 0 to 3) each exploring functions related to the frontal lobes which include conceptualization and abstract reasoning, mental flexibility, motor programming and executive control of action, resistance to interference, self-regulation, inhibitory control and environmental autonomy To assess the prevalence and severity of a dysexecutive syndrome affecting both cognition and motor behaviour

c) Trail Making Test: To assess visual conceptualization and visuomotor tracking (involves motor speed and attention function). It consists of two parts: Trial making A and Trial making B. Trial Making A- The subject was requested to draw lines to connect 50 consequently numbered circles which are randomly distributed. Time of completion noted in seconds. Trail Making B- The subject was requested to draw lines to connect 50 consequently numbered and lettered circles by alternating between two sequences

Statistical Analysis

Data analysis was done with the help of SPSS Version 20. The tests used were the chi-square test, ANOVA, and correlation was analysed using Pearson's correlation coefficient. Two-tailed 'p-value was obtained for all statistical analyses and a score of $p \leq 0.05$ was considered statistically significant.

Results

Groups were compared in relation to age, gender, marital status, education and occupation.

Mini-Mental State Examination (MMSE)

The mean MMSE score of euthymic Bipolar disorder I patients was 27.88 ± 2.455 as compared to 29.14 ± 0.756 in the control group (Table 1). We observed that 6% (n=3) of the euthymic Bipolar disorder I patients had neurocognitive deficits on MMSE as compared to 0% (n=0) controls and this difference was statistically significant (P=0.001).

Table 1: Mini-Mental State Exam

MMSE	Bipolar	Control
Mean	27.50	29.10
SD	2.455	0.756
Range	22-30	28-30

Trail Making Test (T.M.T.)

TMT A- The mean time for completion of TMT-A for euthymic Bipolar disorder I patients was 70.68 ± 31.637 seconds as compared to 39.48 ± 7.657 seconds in the control group. (Table 2). 32% (n=16) of euthymic Bipolar disorder I patients was found to be having neurocognitive deficit on TMT-A as compared to none of the control.

Table 2: TMT A

	Bipolar	Control
Mean	70.58	39.48
SD	31.64	7.66
Range	25-151	25-50

TMT B- The mean time for completion of TMT-B in euthymic Bipolar disorder I was 185.30 ± 78.239 seconds as compared to 88.84 ± 8.321 seconds in the control group. (Table 3)

Table 3: TMT B

TMT-B	Bipolar	Control
Mean	185.20	88.56
SD	78.24	8.32
Range	90-134	80-110

Frontal Assessment Battery (F.A.B.)

The mean score on FAB of the euthymic Bipolar disorder I group was 13 ± 2.89 as compared to 16.20 ± 1.25 for the control group (Table 4). We found that 40% of euthymic Bipolar disorder I patients in our study had a neurocognitive deficit on FAB as compared to 0% of the control group.

Table 4: FAB

FAB test	Bipolar	Control
Mean	13.00	16.20

SD	2.89	1.25
Range	9-17	14-18

Discussion

As a patient with Bipolar disorder, I performed poorly on Trail Making Test B; this indicates poor cognitive flexibility and set-shifting, which are parts of executive functioning. This reveals specific rather than generalized cognitive dysfunctioning which could represent trait or vulnerability marker. These findings are in consonance with some of the previous studies showing impairments of TMT-B in Bipolar Disorder I[7]. Executive dysfunction has been seen in euthymic patients of Bipolar disorder I and is considered to be a potential vulnerability marker. FAB explores conceptualization and abstract reasoning, mental flexibility, motor programming and executive control of action, resistance to interference, self-regulation, inhibitory control and environmental autonomy. 40% of euthymic Bipolar disorder I patients in our study had a neurocognitive deficit on FAB as compared to 0% of the control group. Our findings are complementary to those of recent studies implicating impairment in executive functions, cognitive flexibility, ability to resist, interference and planning[8].

Though in our study any imaging techniques were not used to support the results, cognitive deficits can be explained on the basis of previous studies which correlates cognitive dysfunction with neuroanatomical deficits. The structural MRI studies by Videbech (1997) showed reduced volumes of thalamus and hypothalamus in Bipolar disorder I euthymic patients[9]. Other studies on Bipolar disorder patients suggested that abnormalities in the frontosubcortical neuroanatomic circuit are associated with impaired attention function, abnormalities of temporolimbic structures are associated with deficits in verbal memory and attention, poor psychomotor speed with white matter hyperintensities, impaired executive functions in Bipolar disorder I and Depression attributed to frontal lobe dysfunction. Also, there can be involvement of subcortical nuclei in cognitive processing, particularly working memory and planning future behaviour[10]. Thus, we can conclude that specific neurocognitive dysfunctioning was found in patients with Bipolar disorder I currently in remission phase, which was validated by MMSE, TMT-A, TMT-B and FAB Various factors that influence the cognitive functioning of euthymic bipolar I disorder patients are as follows:

Table 5: Influence of Various Factors on Neurocognitive Profile of Euthymic Bipolar I Disorder Patient

Factors		MMSE	FAB	TMT-A	TMT-B
Age of patient	**Pearson Correlation**	-0.476	-0.583	0.492	0.643
	Significance	P<0.001	P<0.001	P<0.001	P<0.001
Age of onset	**Pearson Correlation**	-0.373	-0.362	0.275	0.461
	Significance	0.008	0.010	0.054	0.001
Duration of illness	**Pearson Correlation**	-0.310	-0.480	0.439	0.478
	Significance	0.029	0.000	0.001	0.000
Number of Total Episodes	**Pearson Correlation**	-0.173	-0.434	0.313	0.352
	Significance	0.229	0.002	0.027	0.012
Number of Manic Episodes	**Pearson Correlation**	-0.208	-0.445	0.356	0.401
	Significance	0.147	0.001	0.011	0.004
Number of Depressive Episodes	**Pearson Correlation**	-0.052	-0.312	0.143	0.158
	Significance	0.719	0.027	0.322	0.273
Family History of Bipolar disorder	**Pearson Correlation**	0.088	-0.165	0.018	-0.037
	Significance	0.545	0.252	0.901	0.798

Conclusion

The cognitive functioning of an individual is very important as it not only reflects patients' socio-occupational functioning and to live independently, but also about the insight of their illness and compliance to treatment. The present study aimed at correlating cognitive functioning in patients with bipolar disorders and healthy controls and our results were in line with Zammit et al[10]. Adequate cognitive remediation at an early stage of illness might improve the outcome of bipolar illness. Therefore, the development of interventions targeting cognitive impairments is imperative for improving recovery rates and quality of life in patients suffering from bipolar disorder.

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