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ORIGINAL ARTICLE

Comparison of Cognitive Functions in Bipolar Disorder Patients with and without Comorbid Borderline Personality Disorder

Eman Ali[1], Asaad A Shalanda[1], Amira Ahmed Foad[1], Wafaa Mohamed Elameen[2]*
[1] Psychiatry Department, Faculty of Medicine, Zagazig University, Zagazig, Egypt
[2] Psychiatry Department, Menouf General Hospital, Egypt

***Corresponding author:**
Wafaa Mohamed Elameen

Email:
wafaa.islam318@gmail.com

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ABSTRACT

Background: Bipolar disorder (BD) and borderline personality disorder (BPD) are both serious psychiatric conditions that elevate the risk for harmful outcomes. Although these conditions represent distinct diagnostic entities, existing research suggests that approximately 20% of individuals with BD meet the criteria for comorbid BPD. **Objectives:** The main aim of this study was to assess the effect of comorbid BPD on the cognitive functions of patients with BD. **Methods:** This cross-sectional study was conducted at the Department of Psychiatry Zagazig University Hospital on 150 patients with BD, out of them there were 40 cases have comorbid BPD. All study population subjected to full history taking, Structured Clinical Interview for DSM-IV Axis I, Axis II Disorders (SCID-I,SCID-II), and Montreal Cognitive Assessment (MoCA). **Results:** There was statistically significant difference between the two groups regarding age, sex, education, occupation, marital status, and smoking. Respecting the psychiatric and family history, there was statistically significant difference between the two groups. There was statistically significant difference between the two groups regarding clinical data MOCA score and cognitive assessment by MOCA score. By comparing between males and females regarding MOCA score, the results was statistically significant. While comparing between cases who were on regular treatment (TTT) and irregular TTT regarding MOCA score, the results was statistically significant. **Conclusion:** In conclusion; the current study showed that the presence of comorbid BPD was associated with worse cognitive functioning in BD patients and more severe cognitive impairment.

Keywords: Cognitive, Bipolar disorder, Borderline personality disorder, Comorbidity.

INTRODUCTION

Common emotions can become profoundly and frequently unpredictablely exaggerated in people with bipolar disorder (BD), a serious mental condition. People with BD can experience abrupt swings between extremes of clarity, vitality, and happiness as well as melancholy, exhaustion, and disorientation. People may think about suicide as a result of these changes since they can be so upsetting **[1].**

In its classic forms, BD is a chronic illness that affects 2.4% of people globally. According to studies, mania/hypomania and depressive crises are neurotoxic, and both the acute and euthymia stages exhibit cognitive impairment. However, because manic episodes are more damaging, bipolar type I patients experience more cognitive dysfunction than type II individuals. In this regard, the number of manic episodes appears to determine the worsening of cognitive impairment as the disease advances, primarily in patients who exhibit psychotic symptoms **[2].**

The studies' findings indicate that learning, verbal memory, visual memory, working memory, sustained attention, information processing speed, and executive functions are all problematic. However, it is uncommon to find deficiencies in language, motor skills, selective attention, or general intellect. The challenge of investigating cognition in BD is one of the causes of the results'

variability. Considerations include the presence of lingering mood symptoms, the length of hospitalization, the severity of the disability, comorbidities (especially addictive), the longitudinal history of the disorder (age of onset, number of episodes, neurotoxic impact of depressive episodes, and detrimental cognitive effects), and many other factors **[3].**

Among the most common and often diagnosed mental illnesses are borderline personality disorder (BPD) and BD. Both are linked to significant functional impairment, higher rates of morbidity, and higher rates of suicide. Although the idea of BPD has been fully assimilated into society in recent years, despite its widespread use among psychiatrists and other mental health professionals, the majority of the general public is still unfamiliar with the diagnosis **[4].**

In patients with BD, the existence of comorbid mental disorders alters the symptoms that are seen, conceals and exacerbates the illness, negatively impacts the response to treatment, makes diagnosis more difficult, and increases deficits in cognitive function. Cognitive function impairments are more common in BD patients with comorbid BPD than in BD patients without comorbid BPD, as may be expected **[5].**

In terms of cognitive processes, the current study attempts to distinguish between BD patients and those who have comorbid BPD who are under medical treatment.

METHODS

***Patients*:**

This cross-sectional study was conducted at Psychiatry Department, Zagazig University Hospital in the period between (September 2023) and (February 2024). Following an explanation of the process and medical study, all participants provided their verbal and written informed consent. The study was carried out in accordance with the Helsinki Declaration, which is the World Medical Association's code of ethics for human research. This study was conducted with the Institutional Review Board (IRB number 10973-19-9-2023).

Sample size:

Assuming that all cases met the inclusion and exclusion criteria were included. During the study period (6 months), 25 cases/ month, 150 cases were included as a comprehensive sample. Diagnosed BD with or without comorbidity of BPD and patients aged 18 to 45 years from both outpatient clinic & inpatient department of psychiatry Zagazig University hospital.

Cases with the following criteria were included; age of patients and the controls ranged between 18-45 years of both sex, and cases accepted to participate in the study and sign the consent.

Cases with the following characteristics were excluded; Patients refused to sign the informed consent. Presence of any serious concomitant general medical condition or neurological disease. Any cases with dementia and any memory impairment.

Methods:

All studied populations were subjected to full history taking including socio-demographic data, manic and hypomanic Episodes, depressive episodes, past psychiatric treatment, hospitalizations, substance use, family psychiatric history, suicidal ideation and attempts clinical history, and history of any personality disorders (PDS).

Structured Clinical Interview for DSM-IV Axis I Disorders [SCID-I]:

The SCID-I, which included a comprehensive psychiatric sheet and enabled each patient to get a mental diagnosis by the end of the study, was used to analyze all studied populations (150 cases), and the DSM-4 criteria were used to confirm the bipolar diagnosis **(American Psychiatric Association, 2000).**

Structured Clinical Interview for DSM-IV Axis II Disorders [SCID-II]:

For PDS, the SCID-II is regarded as the gold standard semi-structured assessment tool. The self-report Personality Questionnaire, a 20-minute forced-choice yes/no screening component consisting of 119 items, is part of SCID-II.

The 10 personality disorders—Avoidant, Dependent, Obsessive-Compulsive Disorder, Paranoid, Schizotypal, Schizoid, Histrionic, Narcissistic, Borderline, and Antisocial—as well as Passive Aggressive and Depressive Personality Disorders were alluded to in the DSM IV-TR on Axis II. The relevant sections of the SCID-II questionnaire were then provided to those who satisfied the self-report criteria for any particular PDS in order to formally diagnose them. When it comes to offering a standardized, thorough evaluation of PDS, SCID-II might be more reliable and helpful.

Montreal Cognitive Assessment (MoCA):

is a widely used screening measure for the presence of cognitive impairment. It takes around ten minutes to finish. Attention, language, abstract reasoning,

delayed recollection, executive function, orientation, and visuospatial skills are all assessed.

Statistical Analysis:

Computer software (EPI-INFO version 6) was used to evaluate the collected data using the proper statistical techniques, and the results were shown in tables and appropriate graphics. For qualitative variables, data were presented as numbers and percentages, and for quantitative ones, as mean + standard deviation (SD). P-values less than 0.05 are regarded as significant.

RESULTS

The mean age of all bipolar cases was 29 ±6.3, ranged from 20 to 40 years with about two third of studied cases were female (66.67%) and more than one half (53.3%) had intermediate education. The other sociodemographic data were listed in Table (1).

One fourth of cases had history of verbal aggression from partner and 10% had history of both verbal and physical aggression, the same percent nearly for history of other person aggression. As regard history of substance abuse, it was noted that all cases had no history of substance abuse either currently or in the past. Regarding previous history and family history of suicide, about two third of cases had no history of suicide,86.7% had no family history of suicide, on other hand 7.3% had previous history of attempt of suicide and no one had family history of attempt of suicide respectively. As regard history of depression and anxiety, only 20% and 10% had no history of depression and anxiety respectively and the remaining 80% and 90% of cases had history depression and anxiety with variant degree. Concerning the clinical data, mean duration of BD among studied cases was 5.9 ±3.3 years, with about three fourth of studied cases were on Mood stabilizer and antipsychotic treatment and only one fourth on Mood stabilizer only, also about 76.7% had taken treatment regularly and about one fourth had taken treatment irregularly. (Table 2)

All studied populations (150 Cases) were evaluated using (SCID-I), which contained a full psychiatric sheet, which allowed each patient to receive a psychiatric diagnosis by its end during which diagnosis of bipolar was confirmed according to the DSM-4 criteria (American Psychiatric Association,2000).

In order to diagnose a PDS, SCID-II was performed on every case. The results of the current study showed that BPD was the most frequently diagnosed PDS by SCID-II, accounting for 26.7% of individuals with BD. then Obss compulsive personality disorder with a percentage of 16.7% then Depressive personality disorder with percentage of 16%. Regarding MOCA score, the mean score for Visuo-spatial and exclusive was 4 ±1.1, mean score for naming was 2.8 ±0.3, mean score for attention was 5 ±1.4, mean score for language was 2.5 ±0.5, mean score for abstraction was 1.8 ±0.36, mean score for recall was 2.5 ±1.5 and finally mean score for Orientation was 5.2 ±1.1. The total MOCA score of all cases with BD was 24±5 and ranged from 8 to 30. Regarding cognitive assessment, it was noted that about 44.7% were normal and had total MOCA score ≥ 26, then 36.7% had mild cognitive assessment with total MOCA score ranged from 18-25, then 16.7% had moderate cognitive assessment with total MOCA score ranged from 10-17 while only 3 cases had severe cognitive assessment with total score ≤10. (Table 3)

The two groups differed statistically significantly in terms of age, sex, education, occupation, marital status, and smoking (p= 0.03, 0.004, 0.009, 0.05, <0.001, and <0.001, respectively). Respecting the psychiatric and family history, there was statistically significant difference between the two groups (p<0.05). (Table 4)

There was statistically significant difference between the two groups regarding clinical data MOCA score and cognitive assessment by MOCA score (P<0.05). (Table 5)

By comparing between males and females regarding MOCA score, the results was statistically significant (p value <0.05) as females had lower MOCA score than males. While comparing between cases who were on regular TTT and irregular TTT regarding MOCA score, the results was statistically significant (p value <0.05) as cases who were on irregular TTT had lower MOCA score than cases who were on regular TTT. (Table 7)

Table 1: Descriptive statistics of Baseline characteristics among all studied cases.

Baseline characteristics		**Cases (n=150)**
Age (years)	Mean ± SD Median (Range)	29 ±6.3 28(20:40)
Sex	Male Female	50(33.3%) 100(66.7%)
Education	Uneducated Low education Intermediate education High education	5(3.3%) 25(16.7%) 80(53.3%) 40(26.7%)
Occupation	Students Housewife Employee Manual worker Skilled	30(20%) 50(33.3%) 50(33.3%) 15(10%) 5(3.3%)
Marital statues	Single Married Divorced /widow	35(23.3%) 90(60%) 25(16.7%)
Social class	Low Middle High	36(24%) 106(70.7%) 8(5.3%)
Residence	Urban Rural	105(70%) 45(30%)
Smoking	Non-smoker Current smoker X-smoker	100(66.7%) 35(23.3%) 15(10%)

Table 2: Past psychiatric history, family history, and clinical data among all studied cases

Baseline characteristics		**Cases (n=150)**
History of partner aggression	NO aggression Verbal aggression Both verbal & Physical aggression	99(66%) 36(24%) 15(10%)
History of other person's aggression	NO aggression Verbal aggression Both verbal & Physical aggression	96(64%) 37(24.7%) 17(11.3%)
Substance abuse	Never Once Current	150(100%) 0(0%) 0(0%)
Previous history of suicide	No suicide Ideation Attempt	99(66%) 40(26.7%) 11(7.3%)
Family history of suicide	No suicide Ideation Attempt	130(86.7%) 20(13.3%) 0(0%)
Family history of psychiatric illness	No MR Schizophrenia	115(76.7%) 10(6.7%) 25(16.7%)

Baseline characteristics		Cases (n=150)
History of depression	No Mild Moderate Severe	30(20%) 30(20%) 55(36.7%) 35(23.3%)
History of anxiety	No Mild Moderate Severe	15(10%) 35(23.3%) 65(43.3%) 35(23.3%)
Drug intake	Mood stabilizer Mood stabilizer+ antipsychotic	35(23.3%) 115(76.7%)
Regularity of TTT	Regular Irregular	115(76.7%) 35(23.3%)
Duration of disease (years)	Mean ± SD Median (Range)	5.9 ±3.3 5(1:15)

Table 3: Descriptive statistics of results of SCID-II and MOCA scales among all studied cases.

		Cases (n=150)
SCID-II		Number (%)
Avoidant personality disorder		20(13.3%)
Dependent personality disorder		5(33.3%)
Obss compulsive personality disorder		25(16.7%)
Passive-aggressive personality disorder		5(33.3%)
Depressive personality disorder		24(16%)
Paranoid personality disorder		10(6.7%)
Schizotypal personality disorder		10(6.7%)
Schizoid personality disorder		5(3.3%)
Histrionic personality disorder		5(3.3%)
Narcissistic personality disorder		5(3.3%)
Borderline personality disorder		40(26.7%)
Anti-social personality disorder		10(6.7%)
Not otherwise specified		50(33.3%)
MOCA		Mean±SD – Median (Range)
Visuo-spatial and exclusive		4 ±1.1- 4(1:5)
Naming		2.8 ±0.3 - 3(1:3)
Attention		5 ±1.4 - 6(1:6)
Language		2.5 ±0.5 - 3(1:3)
Abstraction		1.8 ±0.36 - 2(1:2)
Recall		2.5 ±1.5 - 3(0:5)
Orientation		5.2 ±1.1 - 6(1:6)
Cognitive assessment by MOCA score		
Total MOCA score		24±5 - 25(8:30)
Cognitive assessment	**No** (MOCA ≥26) **Mild** (MOCA18-25) **Moderate** (MOCA 10-17) **Severe** (MOCA <10)	67(44.7%) 55(36.7%) 25(16.7%) 3(2%)

Table 4: Comparison between cases with BD and cases with BD+BPD regarding Baseline characteristics, and psychiatric and family history.

Baseline characteristics		**BD (n=110)**	**BD+ BPD (n=40)**	**P value**
Age (years)	Mean ± SD Median (Range)	28±5.4 28(20:40)	31.5±7.8 33(20:40)	0.03*
Sex	Male Female	44(40%) 66(60%)	6(15%) 34(85%)	0.004*
Education	Uneducated Low education Intermediate education High education	5(4.5%) 20(18.2%) 50(45.5%) 35(31.8%)	0(0%) 5(12.5%) 30(75%) 5(12.5%)	0.009*
Occupation	Students Housewife Employee Manual worker Skilled	25(22.7%) 40(36.4%) 30(27.3%) 10(9.1%) 5(4.5%)	5(12.5%) 10(25%) 20(50%) 5(12.5%) 0(0%)	0.05*
Marital statues	Single Married Divorced /widow	15(13.6%) 85(77.3%) 10(9.1%)	20(50%) 5(12.5%) 15(37.5%)	<0.001*
Social class	Low Middle High	27(24.5%) 79(71.8%) 4(3.6%)	9(22.5%) 27(67.5%) 4(10%)	0.30
Residence	Urban Rural	75(68.2%) 35(31.8%)	30(75%) 10(25%)	0.42
Smoking	Non-smoker Current smoker X-smoker	65(59.1%) 35(31.8%) 10(9.1%)	35(87.5%) 0(0%) 5(12.5%)	<0.001*
History of partner aggression	NO aggression Verbal aggression Both verbal & Physical aggression	75(68.2%) 21(19.1%) 14(12.7%)	29(47.5%) 20(50%) 1(2.5%)	<0.001*
History of other person's aggression	NO aggression Verbal aggression Both verbal & Physical aggression	69(62.7%) 31(28.2%) 10(9.1%)	23(57.5%) 8(20%) 9(22.5%)	0.05*
Previous history of suicide	No suicide Ideation Attempt	77(70%) 22(20%) 11(10%)	22(55%) 18(45%) 0(0%)	0.003*
Family history of suicide	No suicide Ideation Attempt	100(90.9%) 10(9.1%) 0(0%)	30(75%) 10(25%) 0(0%)	0.03*
Family history of psychiatric illness	No MR Schizophrenia	85(77.3%) 10(9.1%) 15(13.6%)	30(75%) 0(0%) 10(25%)	0.05*
History of depression	No Mild Moderate Severe	25(22.7%) 20(18.2%) 45(40.9%) 20(18.2%)	5(12.5%) 10(25%) 10(25%) 15(37.5%)	0.03*

History of anxiety	No Mild Moderate Severe	10(9.1%) 35(31.8%) 45(40.9%) 20(18.2%)	5(12.5%) 0(0%) 20(50%) 15(37.5%)	<0.010*

Table 5: Comparison between cases with BD and cases with BD+BPD regarding clinical data, MOCA score, and cognitive assessment among all studied cases by MOCA score.

clinical data		**BD (n=110)**	**BD+ BPD (n=40)**	**P value**
Clinical data				
Drug intake	MS MS+ AP	30(27.3%) 80(72.7%)	5(12.5%) 35(87.5%)	0.05
Regularity of TTT	Regular Irregular	90(81.8%) 21(18.2%)	25(52.5%) 15(37.5%)	0.01
Duration of disease (years)	Mean ± SD Median (Range)	5.1±3 5(1:15)	6.7±3.7 6(2:12)	0.03
MOCA score				
Visuo-spatial and exclusive	Mean ± SD Median (Range)	4.4 ± 0.7 5(2:5)	2.9±1.1 2(1:5)	<0.001
Naming	Mean ± SD Median (Range)	2.9 ±0.1 3(2:3)	2.5±0.5 3(1:3)	<0.001
Attention	Mean ± SD Median (Range)	5.7 ±0.5 6(4:6)	3.1±1.3 3(1:6)	<0.001
Language	Mean ± SD Median (Range)	2.5 ±0.5 3(2:3)	2.3±0.5 2(1:3)	0.009
Abstraction	Mean ± SD Median (Range)	1.9 ±0.09 2(1:2)	1.5±0.5 1(1:2)	<0.001
Recall	Mean ± SD Median (Range)	3.2±1.1 3(1:5)	1.1±1.2 1(0:5)	<0.001
Orientation	Mean ± SD Median (Range)	5.7 ±0.7 6(3:6)	4±1.1 4(1:5)	<0.001
Cognitive assessment by MOCA score				
Total MOCA score	Mean ± SD Median (Range)	26±2.2 26(17:30)	17.5±4 17(9:24)	<0.001
Cognitive assessment	**No** (MOCA ≥26) **Mild** (MOCA18-25) **Moderate** (MOCA 10-17) **Severe** (MOCA <10)	67(60.9%) 42(38.2%) 1(0.9%) 0(0%)	0(0%) 13(32.5%) 24(60%) 3(7.5%)	<0.001

Table 6: Correlation between MOCA score and cases with BD and cases with BD+BPD regarding other variables.

	MOCA total score			
	BD (n=110)		**BD+ BPD (n=40)**	
	R	**P value**	**r**	**P value**
Age	0.143	0.135	-0.120	0.461
Sex	-0.253**	**0.008**	0.327*	**0.039**
Education	0.065	0.500	0.400*	**0.011**
Social class	0.00	0.999	0.031	0.850
History of partner aggression	-0.353**	**<0.001**	-0.102	0.531
History of suicide	-0.026	0.787	-0.161	0.320
Duration of illness	-0.081	0.400	-0.441**	**0.004**
Irregularity of TTT	-0.002	0.984	-0.203	0.208

Table 7: Comparison between males and females, regular and irregular TTT regarding MOCA score.

MOCA score	**Male (n=50)**	**Female (n=100)**	**P value**
Mean ± SD Median (Range)	25.7±4.8 27(9:30)	23.8±4.8 25(9:30)	0.005*
MOCA score	**Regular TTT (n=115)**	**Irregular TTT (n=35)**	**P value**
Mean ± SD Median (Range)	24.7±4.4 25(9:30)	22.2±6 25(9:30)	0.03*

DISCUSSION

In comparison to BD patients without comorbidities, research revealed that patients with comorbid BPD exhibited more severe symptoms and worse outcomes in a number of areas, including more frequent mixed and depressive episodes, more severe emotional symptoms, and more hospitalizations [6,7].

The main aim of this study was to assess the effect of comorbid BPD on the cognitive functions of patients with BD.

This comparative study was carried out on 150 BD patients at Zagazig University Hospital's Department of Psychiatry, out of them there were 40 cases have comorbid BPD.

Regarding age, the current study showed that the mean age of all bipolar cases was 29 ±6.3, ranged from 20 to 40 years. The patients with BD+BPD were significantly older than those with BD only, as mean age was significantly higher in cases with BD+BPD (31.5±7.8) than in cases with BD only (28±5.4). In agreement with the current study Zimmerman et al., [6] revealed that BD+BPD patients were considerably older than BD patients alone (p=0.03). This was backed by Frías et al., [8] and Baltacioglu et al., [9] They discovered that patients with BD who also had concomitant BPD recalled having BD at a younger age. In contrast to the current study Bayes et al., [10] found no significant difference between patients with BD+BPD and BD only as regard age. As average age in BD group 33 years and in comorbid BD/BPD was 32 years (p=0.55). Also, Wang et al., [11] found no significant difference between patients with BD+BPD and BD only as regard age. The contrast may be due to differences in sample size, environmental factors, and inclusion criteria.

In agreement with the current study results concerning sex, Bayes et al., [10] discovered a significant sex-based difference between patients with BD+BPD and BD only, with a higher proportion of females in the comorbid BD/BPD group (80.8%) than in the BD group (53.7%) (p<0.001). But in contrast to the recent research, Zimmerman et al., [6] Baltacioglu et al., [9] and Wang et al., [11] found no significant difference between patients with BD+BPD and BD only as regard sex, the contrast may be due to difference in cultures.

Regarding education, the current study revealed that more than one-half (53.3%) had intermediate education. There was a significantly higher percentage of intermediate education and employee were found among cases with BD+BPD than in BD patients (p value <0.05). In line with the current study Bohus et al., [12] stated that BPD was associated with various poor outcomes, including low educational attainment. However, in contrast to the current study Zimmerman et al., [6] Baltacioglu et al., [9] and Wang et al., [11] discovered no significant difference in education between BD+BPD patients and BD patients alone; this discrepancy might be the result of cultural differences in sample size and educational priorities. Regarding occupation of studied cases, we found that about one third were housewife and one third were employee and only 3.3% had skilled occupation. The study discovered a strong correlation (p value <0.05) between occupation and the occurrence of BPD in BD patients. Consistent with the current research Kaplan et al., [13] revealed that patients with BPD have a significantly higher prevalence of unemployed due to longer hospital stays among patients with comorbid BPD. Also, Bohus et al., [12] stated that BPD was associated with lower occupational attainment. Also, Zimmerman et al., [6] reported that individuals with both BPD and BD constitute a group of people who have high levels of psychosocial morbidity and are frequently unemployed.

In this study for marital state, it was noted that, the majority of cases (60%) were married and nearly one fourth were single and the remaining cases were widow or divorced. In this study one half of cases with BD+BPD were single while the majority of BD cases (77.3%) were married with significant differences (p value <0.05). In agreement with the current study Baltacioglu et al., [9] demonstrated that the group with comorbid diagnoses had a statistically significant higher rate of single/divorced people than the group without additional diagnoses (χ^2 = 7.726 and p =.005). Zimmerman et al. [6] observed no significant difference between patients with BD+BPD and BD just with regard to marital status, which contrasts with the current study. This discrepancy may be caused by differences in sample size and mean age.

As regard history of substance abuse, we noted that all cases had no history of substance abuse either currently or in the past, this may be a result of the cultural limitations of substance abuse especially among females and young people, as majority of patients were females and young aged. However, Anona et al., [14] revealed that people with BD and BPD had a greater rate of substance addiction (50%) than those with BD alone (44.1%) (P<0.001). Additionally, Riemann et al. [15] found that BD patients with comorbid BPD are more likely to be hospitalized and are at higher risk of substance addiction. Furthermore, it was demonstrated by Zimmerman et al. [6] that BD in BPD patients was linked to a higher prevalence of substance use disorders in their family members.

In terms of prior suicide history, the current study revealed that a significant percentage of patients with BD+BPD had a prior history of suicidal thoughts (45%), whereas cases with BD had a statistically significant 20%. In BD, comorbid diagnosis raises the risk of suicide; this rate is 25–50% in the literature [9]. This circumstance might be connected to the fact that these patients frequently feel anxious when they feel more alone due to their impulsive behavior and despair when they lose the significance of their lives. Consistent with the current research Zimmerman et al., [6] demonstrated that a higher risk of suicide attempts was linked to BD in BPD patients. Additionally, it was demonstrated by Perugi et al. [16] that individuals with BPD+BD had a considerably higher likelihood of having attempted suicide in the past. The current study discovered a strong correlation between the occurrence of BPD in patients with BD and the presence of a family history of mental illness or suicide. Family history was thought to be a poor predictive factor for BD [17]. Two possible interpretations of this circumstance are that the presence of family history contributes to a severe course of the disease and that these patients visit treatment centers more frequently or that social support factors play a role in the treatment. Consistent with the current research Baltacioglu et al., [9] revealed that both groups had a much greater rate of family history, with the comorbid diagnosed group having a significantly higher prevalence. But when it comes to family history of mental illness, Perugi et al. [16] found no significant difference between BD patients with and without BPD; this discrepancy might be caused by different genetic variables.

As regards history of depression and anxiety, our findings were in agreement with the current study Zimmerman et al., [6] showed that the presence of BD in patients with BPD was associated with more severe of depression and anxiety. Also, El Ghamry

et al., [18] revealed that the patients with BD+BPD have higher prevalence of major depression compared to BD cases.

As regards clinical data, the current study was in agreement with the study Brieger et al., [19] reported that in comorbid diagnosed BD cases the total duration of the disorder is longer. However, Baltacioglu et al., [9] and Wang et al., [11] found that there was no significant difference in the length of the disorder between the BD and BD+BPD groups.

Also, in concordance with the current study Baltacioglu et al., [9] revealed that individuals with comorbid BD+BPD used mood stabilizers at a considerably lower rate than patients with BD alone (p =.039). Furthermore, a case-control study was conducted by Swartz et al., [20] discovered that the comorbid group had greater rates of dropout, increased utilization of extra drugs (such as mood stabilizers and/or atypical pharmaceuticals), and worse stabilization rates.

The current study showed higher percentage of irregular treatment among BD+BPD group. This was supported by Hidalgo-Mazzei et al., [21] revealed that patients with BPD were significantly more likely to prematurely dropout of treatment. However, Steuwe et al., [22] found no association between treatment dropout and the presence of comorbid BPD, the disagreement may be due to the difference in sample size and treatment modality.

In agreement with SCID-II findings of the current study Chad et al., [23] showed that among patients receiving treatment at both inpatient and outpatient mental health facilities, BPD seems to be the most prevalent PDS. Furthermore, Leichsenring et al., [24] demonstrated that the most common PDS identified in clinical settings is BPD.

Regarding severity of cognitive assessment, our results were in agreement with the current study, Lapomarda et al. [25] demonstrated that comorbid BD+BPD patients performed worse in visual, auditory, and dual-channel working memory and had slower perceptual speeds than BD patients.

Also, in concordance with the current study Baltacioglu et al., [9] demonstrated that the average scores of CVLT free delayed recall, TMT-A duration and number of errors, TMT-B duration and number of errors, and Stroop Color Word duration were statistically significantly lower for patients with comorbid diagnoses (P-value<0.05).

Moreover, Folesani et al., [26] The MOCA scale was used to measure cognitive impairment in psychiatry patients with BPD. The results showed that, in comparison to a control group, patients with BPD had significantly lower values for both the MOCA domains and the whole MOCA scale. Also, Özlem and Özge, [27], another case-control study, revealed that BPD patients had significantly worse scores in all of the MOCA's cognitive areas than the controls (p<0.05). Furthermore, Zhuo et al., [28] showed that total MOCA scale was significantly lower the BPD group than the control group.

In BD+BPD group, this study revealed that there was a significant positive correlation between MOCA total score and sex also with education with significant p value <0.05, increase level to education and being female will be associated with increase in total MOCA score, while there was significant negative correlation between MOCA total score and duration of illness with significant p value <0.05, this mean increase duration of illness will be associated with decrease in total MOCA score

In agreement with the current study Kim & Park, [29] showed that older age and female gender were significantly associated with cognitive impairment among patients with BD. Also, Beunders et al., [30] found significant negative correlation between cognitive score and age of BD patients, but in contrast to our results, they revealed that educational level was significantly correlated with cognitive score. As well, Tournikioti et al., [31] showed that gender was a significant determinant in neurocognitive functioning in BD.

In concordance with the current study Melloni et al., [32] showed that, as sickness progression is linked to worse cognitive performances in BD, there was a strong correlation between the length of the disease and cognitive performance in BD. But Beunders et al., [30] found no association between disease duration and cognitive score in BD.

Also, in agreement with the current study Ram et al., [33] comprised 200 people who had attempted suicide and showed that impulsivity and a lack of cognitive flexibility and resilience are thought to be the root causes of suicide attempts.

To our knowledge, this is the first study assessed the above correlation in patients with BD patients with comorbid BPD.

In the present study, while comparing between males and regarding MOCA score, the results was statistically significant (p value <0.05) as females had lower MOCA score than males.

In agreement with the current study Kim & Park, [29] showed that female gender was significantly related with cognitive impairment among patients

with BD. As well, Tournikioti et al., [31] revealed that gender has a significant effect on neurocognitive functioning in BD.

In the current study the comparison between cases who were on regular TTT and irregular TTT regarding MOCA score showed statistically significant (p value <0.05) as cases who were on irregular TTT had lower MOCA score than cases who were on regular TTT.

The association between cognitive functioning and irregularity of treatment could be explained by Swartz et al., [20] and Steuwe et al., [22] showed that irregularity of treatment had negative impact on the progression of comorbid BPD in patients with BD which in role was associated with poor cognitive functioning.

To the best of our knowledge this is the first study that aimed to assess the effect of irregularity of treatment or aggression exposure on cognitive functioning in patients with BD.

We recommend in further researches to use Suicidal Ideation Questionnaire, aggression Questionnaire for more precise data and recommended to use California verbal learning test, Wisconsin card sorting test, trail-making test (TMT), and stroop test to investigate all domains of cognitive functions.

CONCLUSION

In summary, the current study demonstrated that comorbid BPD was linked to more severe cognitive impairment and poorer cognitive performance in BD patients. Knowing the factors associated with comorbidity between BD and BPD is crucial in order to develop appropriate treatments for subjects with both disorders, improve their clinical course, and prevent the increased risk of suicidality that is frequently observed in these subjects.

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Consent for publication

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Competing interests

The authors declare that they have no competing interest.

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