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A Study of Sleep patterns among Bipolar disorder patients – A Correlation Study

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Abstract:
Background: *Sleep disturbance is a core symptom of Bipolar Disorder (BD). The diagnostic criteria indicate that during manic episodes there may be a reduced need for sleep and during episodes of depression, insomnia or hypersomnia can be experienced nearly every day. There exists a bidirectional relationship between sleep disturbance and mood disorders, as the symptoms of mood disorders may disrupt sleep and disrupted sleep can increase symptoms of mood disorders.*
Materials and Methods: *In this study, a total of 50 bipolar disorder patients were recruited. Amongst of them 40 patients were of Mania and 10 of depression. It was done for three months in Government Hospital for Mental Care, Visakhapatnam. A semi-structured Clinical Interview for DSM-5 Axis I Disorders for diagnosis of BD and Beck Depression Inventory-II was applied for Depression patients and Young Mania Rating Scale (YMRS) was applied for Mania patients to assess the severity of BD. Assessment of sleep pattern was carried out by Pittsburgh Sleep Quality Index (PSQI).*
Results: *There was a significant positive correlation between YMRS and PQSI ($p<0.001$); with a mean 29.7500 and standard deviation 10.169; and a significant positive correlation between BD- II and PQSI($p<0.001$) with a mean 27.0000 and standard deviation 5.75423.*
Conclusion: *The more the severity of BD, the higher the sleep disturbance in depression and mania patients.*
Keyword: *Bipolar disorder, Sleep disturbance, Pittsburgh Sleep Quality Index, Beck's Depression inventory- II, Young's Mania Rating Scale, Circadian period.*

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I. Introduction

Bipolar disorder is a serious mental disorder characterized by episodes of mania /hypomania, depression and mixed episodes with the inter episodic recovery. Sleep is a reversible behavioural state of perceptual disengagement and unresponsiveness to the environment.[2] Sleep disturbances during the inter episodic phase seem to be related to subsyndromal affective symptoms, and maybe a risk factor for recurrence of a new mood episode. The brain circuitry that regulates sleep and produces wakefulness includes cell groups in the brainstem, hypothalamus, and basal forebrain that are crucial for arousing the cerebral cortex and thalamus.[3] Alteration in sleep duration is associated with more severe BD symptoms and worse functioning and quality of life. The diagnostic criteria indicate that during manic episodes there may be a reduced need for sleep and during episodes of depression, insomnia or hypersomnia can be experienced nearly every day. Changes in sleep patterns predict new episodes and are a prognostic marker for episode outcomes for all polarities of BD.[4] Biological rhythm pathways are highlighted in several etiological models of bipolar disorder, and the management of circadian instability appears in consensus treatment guidelines. There is evidence that sleep disturbance may be causally related to recurrence. Disturbance in sleep is a common prodrome of both manic and depressive episodes.[10]

Few studies, however, have prospectively monitored sleep quality and mood episode status. One study found that shorter sleep duration predicted greater depressive, but not manic, symptoms over 6 months in patients with bipolar I disorder.[9] **Barbini et al. (1996)** monitored 34 patients with mania over three days for sleep duration and manic symptoms and found significant correlations between decreased sleep duration and increased manic symptoms the subsequent day[12] They found that a decrease in sleep or bed rest was followed by a shift towards hypomania/mania on the next day, whereas an increase in sleep or bed rest was followed by a shift towards depression the next day. Taken together, these studies find longitudinal associations between sleep disturbance and mood changes in bipolar disorder, although the nature of the association – whether sleep disturbance is more related to manic or depressive symptoms –is less consistent. Given the potential importance of disturbed sleep in stimulating manic episodes and the fact that persistent sleep disturbance is common in

euthymia, managing sleep complaints is a fundamental priority in bipolar disorder. It is thus essential that clinicians have an understanding of the disparate causes of sleep problems in bipolar patients and develop a systematic approach to managing sleep complaints.[16] The current study aims at studying the nature of sleep disturbance in Bipolar patients and to detect the correlation between the severity of the bipolar disorder and sleep disturbance.

II. Material And Methods

Study Design: Correlation study
Study Location: The present study was carried out in the Government Hospital for Mental Care, Visakhapatnam.
Study Duration: Three months from March 2020 to May 2020.
Sample size: 50 patients.
Methodology: All study patients were recruited with their written informed consent who consecutively attended the outpatient department of this hospital. A semi-structured Clinical Interview for DSM-5 Axis I Disorders for diagnosis of Bipolar disorder, Beck Depression Inventory-II was applied for Depression patients and Young Mania Rating Scale (YMRS) was applied for Mania patients to assess the severity of Bipolar disorder. Assessment of sleep pattern was carried out by the Pittsburgh Sleep Quality Index (PSQI). Beck Depression Inventory-II is a questionnaire consisting of 21 groups of statements and patients were asked to pick out the statement that describes best the way they have been feeling during the past two weeks including today and was graded as mild, borderline, moderate, severe and extreme depression. YMRS consists of four items graded on a 0 to 8 scale (irritability, speech, thought content and disruptive/aggressive behaviour), while the remaining seven items are graded on a 0 to 4 scale which is given twice the weight of the others to compensate for poor cooperation from severely ill patients and are graded depending on the score as remission, minimal, mild, moderate and severe mania. PQSI consists of 19 items that are combined to form seven component scores, each of which has a range of 0-3 points. A study was done in 2015 May in New Delhi, India by **Md Dilshad Manzar et al.**, which supports the applicability and certain aspects of the validity of the PSQI in the Indian population.[7]
The sample finally comprises 50 patients, of which 40 were mania patients and 10 are of depression.
Inclusion criteria & Exclusion criteria: Only patients above 18 years were recruited in this study. Patients with medical comorbidities were included only after confirming their health status with relevant examinations and investigations. In this study patient demographic data such as age, sex, marital status, were taken. Patients with mania and depression were administered the PQSI scale which separately consists of components of subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication and daytime dysfunction.
Statistical analysis: Data was analysed using the Statistical Package for the Social Sciences (SPSS), Windows version 25. Descriptive statistics were used to analyse the demographic data. Correlations of YMRS and PQSI and that of BD II and PQSI were done using Pearson correlation. P-value (<0.001) was considered significant.

III. Results

Descriptive Statistics

Table no 1: Age and gender distribution

Variable	Category	Group 1		Group 2		P-Value
		Mean	SD	Mean	SD	
Age	Mean & SD	35.85	9.77	42.00	8.30	0.07[a]
	Range	20 - 60		31 - 58		
		n	%	n	%	
Sex	Males	24	60.0%	6	60.0%	1.00[b]
	Females	16	40.0%	4	40.0%	

a. Mann Whitney Test; b. Chi-Square Test
Note: Group 1 - Maniac patients; Group 2 - Depression patients

Figure no 1: Age wise distribution

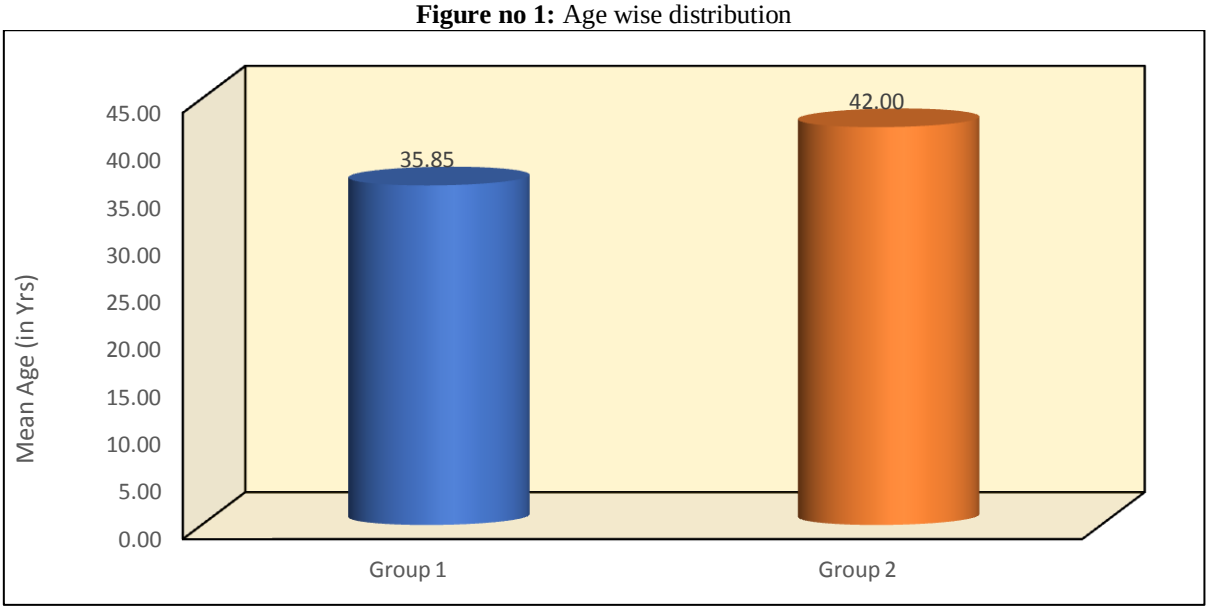


Table No 2: Comparison of Marital Status between 2 groups using Chi-Square Test

Variable	Category	Group 1		Group 2		P-Value
		n	%	n	%	
Marital Status	Married	35	87.5%	10	100.0%	0.24
	Unmarried	5	12.5%	0	0.0%	

Figure No 2: Marital Status between 2 groups

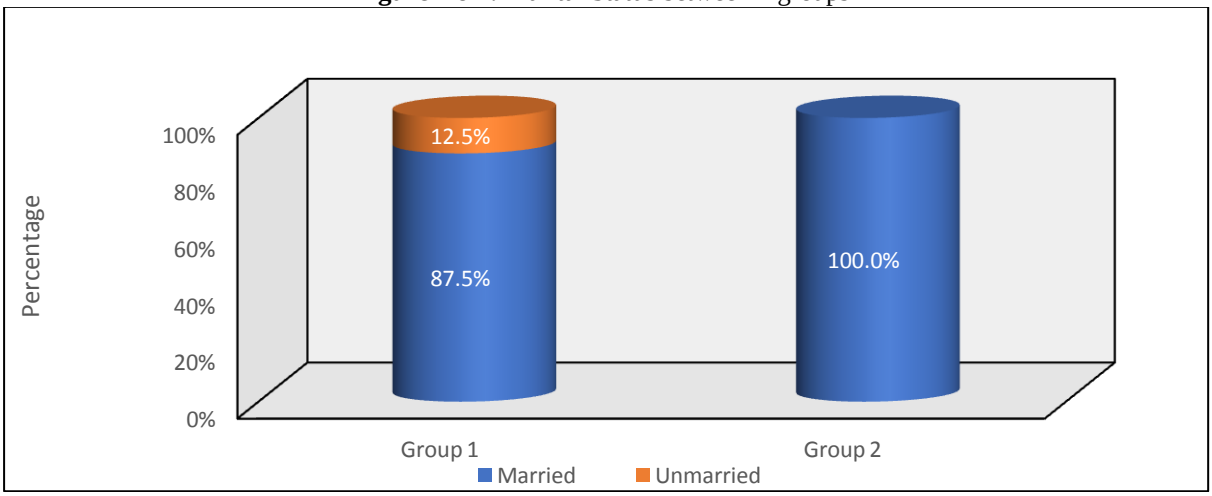


Table No 3: Comparison of mean duration of illness (in yrs) between 2 groups using Mann Whitney Test

Groups	N	Mean	SD	Mean Diff	P-Value
Group 1	40	6.25	4.95	-4.45	0.02*
Group 2	10	10.70	5.21		

* - Statistically Significant

Figure No 3: Mean duration of illness (in years)

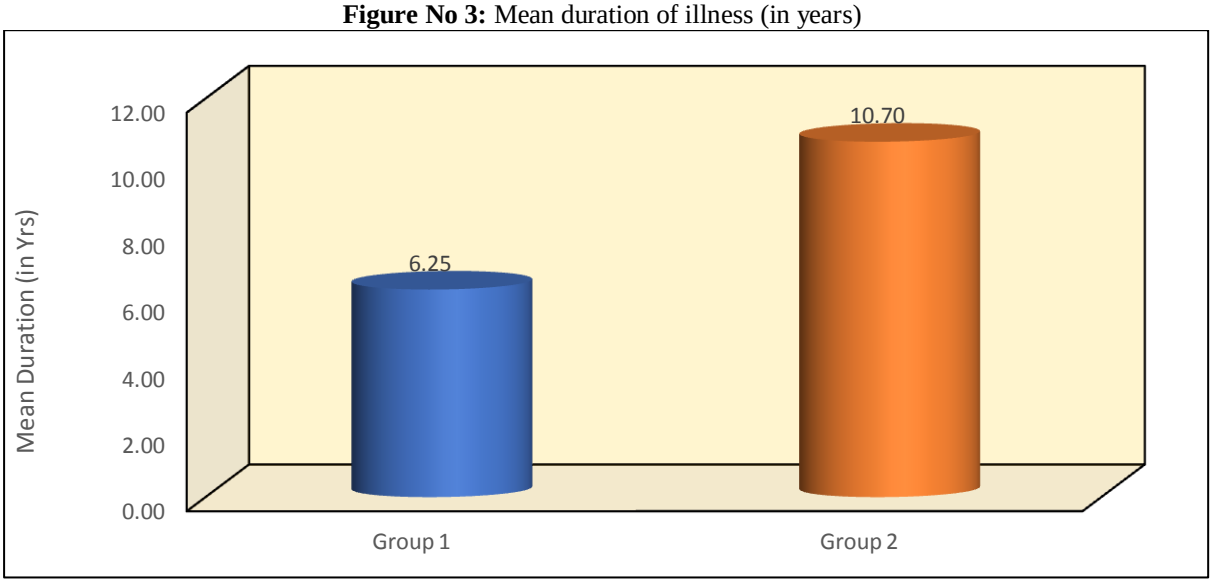


Table No 4: Descriptive for different parameters in Group 1

Parameters	Mean	SD	Min	Max
YMRS	29.75	10.17	3	46
Subjective sleep quality	2.22	0.86	0	3
Sleep latency	2.65	0.58	1	3
Sleep duration	2.35	0.66	1	3
Habitual sleep efficiency	1.93	0.94	0	3
Sleep disturbance	1.80	0.85	0	3
Daytime dysfunction	1.50	0.93	0	3

Table No. 5: Descriptive for different parameters in Group 2

Parameters	Mean	SD	Min	Max
BDI II	27.00	5.75	20	38
Subjective sleep quality	2.30	0.48	2	3
Sleep latency	2.60	0.52	2	3
Sleep duration	1.90	0.57	1	3
Habitual sleep efficiency	2.40	0.70	1	3
Sleep disturbance	2.40	0.52	2	3
Use of Sleep Medication	1.60	0.97	0	3
Daytime dysfunction	2.70	0.48	2	3

Table No 6: Comparison of mean scores of different domains of PSQI between 2 groups using Mann Whitney Test

Parameters	Groups	N	Mean	SD	Mean Diff	P-Value
Subjective sleep quality	Group 1	40	2.23	0.86	-0.07	0.88
	Group 2	10	2.30	0.48		
Sleep latency	Group 1	40	2.65	0.58	0.05	0.63
	Group 2	10	2.60	0.52		
Sleep duration	Group 1	40	2.35	0.66	0.45	0.04*

	Group 2	10	1.90	0.57		
Habitual sleep efficiency	Group 1	40	1.93	0.94	-0.47	0.16
	Group 2	10	2.40	0.70		
Sleep disturbance	Group 1	40	1.80	0.85	-0.60	0.04*
	Group 2	10	2.40	0.52		
Daytime dysfunction	Group 1	40	1.50	0.93	-1.20	<0.001*
	Group 2	10	2.70	0.48		

* - Statistically Significant

Table no 7: Comparison of mean PSQI scores between 2 groups using Mann Whitney Test

Groups	N	Mean	SD	Mean Diff	P-Value
Group 1	40	12.45	4.28	-3.45	0.03*
Group 2	10	15.90	3.54		

* - Statistically Significant

Figure No.4: Mean scores of different domains of PSQI

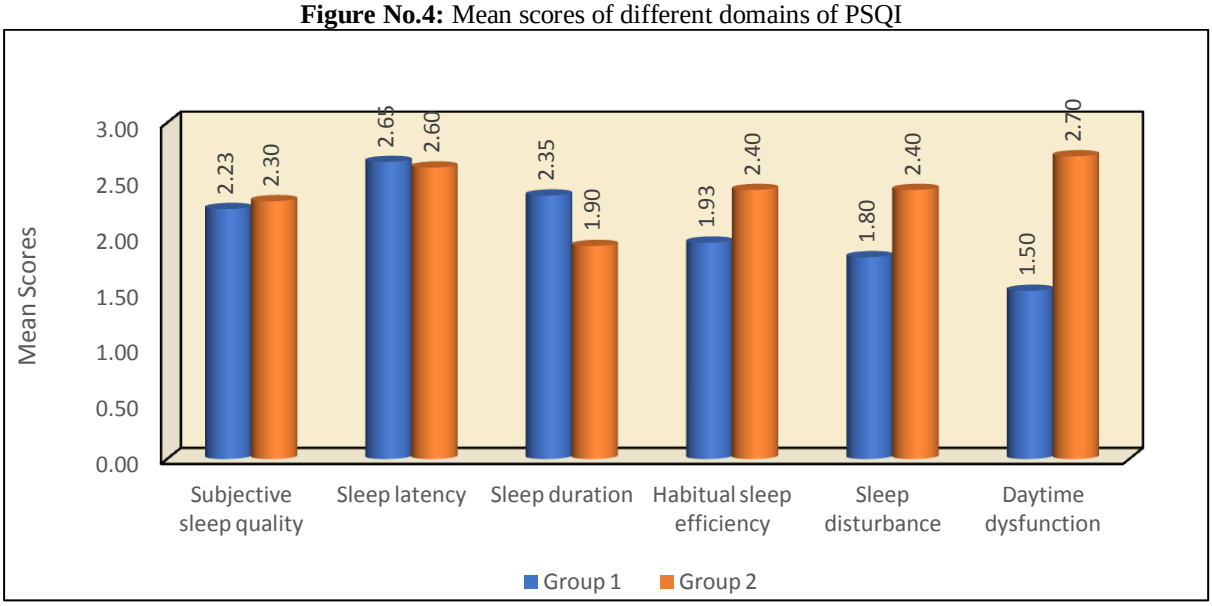


Table no 8: Spearman's correlation test to assess the relationship b/w YMRS, different domains of PSQI scores in Group 1

Variable	values	Subjective sleep quality	Sleep latency	Sleep duration	Habitual sleep efficiency	Sleep disturbance	Daytime dysfunction
YMRS	rho	0.85	0.67	0.82	0.83	0.84	0.79
	P-Value	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*
	N	40	40	40	40	40	40

* - Statistically Significant

The correlation coefficients are denoted by 'rho'
Minus sign denotes the negative correlation
Correlation coefficient range
0.0 - No Correlation
0.01 - 0.20 - Very Weak Correlation
0.21 - 0.40 - Weak Correlation
0.41 - 0.60 - Moderate Correlation
0.61 - 0.80 - Strong Correlation

0.81 - 1.00 - Very Strong Correlation

Table No 9: Spearman's correlation test to assess the relationship b/w BDI II, different domains of PSQI scores in Group 2

Variable	values	Subjective sleep quality	Sleep latency	Sleep duration	Habitual sleep efficiency	Sleep disturbance	Use of sleeping medication	Daytime dysfunction
BDI II	rho	0.76	0.86	0.71	0.78	0.75	0.89	0.80
	P-Value	0.01*	0.001*	0.02*	0.008*	0.01*	0.001*	0.005*
	N	10	10	10	10	10	10	10

* - Statistically Significant

Table No 10: Spearman's correlation test to assess the relationship b/w YMRS and PSQI Scores in Group 1

Variable	values	PSQI
YMRS	rho	0.93
	P-Value	<0.001*
	N	40

* - Statistically Significant

Table No 11: Spearman's correlation test to assess the relationship b/w BDI II and PSQI Scores in Group 2

Variable	values	PSQI
BDI II	rho	0.94
	P-Value	<0.001*
	N	10

* - Statistically Significant

Table No12: Simple linear regression analysis to predict the PSQI scores by YMRS scores in Group 1

Group	Ind. Variable	Unstd. Coefficients		t	P-Value	R^2
		b	Std. Error			
Group 1	Constant	0.65	0.72	0.912	0.37	0.88
	YMRS	0.40	0.02	17.400	<0.001*	

* - Statistically Significant

Interpretation: For every 1 score increase in YMRS scores, the PSQI will significantly increase by 0.40 scores in group 1 [P<0.001]. The variability in PSQI scores will be able to explain by YMRS scores in group 1 by 88%.

PSQI = 0.40 x YMRS + 0.65

Table No13: Simple linear regression analysis to predict the PSQI scores by BDI II scores in Group 2

Group	Ind. Variable	Unstd. Coefficients		t	P-Value	R^2
		b	Std. Error			
Group 1	Constant	0.23	1.99	0.113	0.91	0.89
	BDI II	0.58	0.07	8.028	<0.001*	

* - Statistically Significant

Interpretation: For every 1 score increase in BDI II scores, the PSQI will significantly increase by 0.58 scores in group 2 [P<0.001]. The variability in PSQI scores will be able to explain by BDI II scores in group 1 by 89%.

PSQI = 0.58 x BDI II + 0.23

Figure No 5: Scatterplot depicting the relationship b/w YMRS & PSQI Scores in Group 1

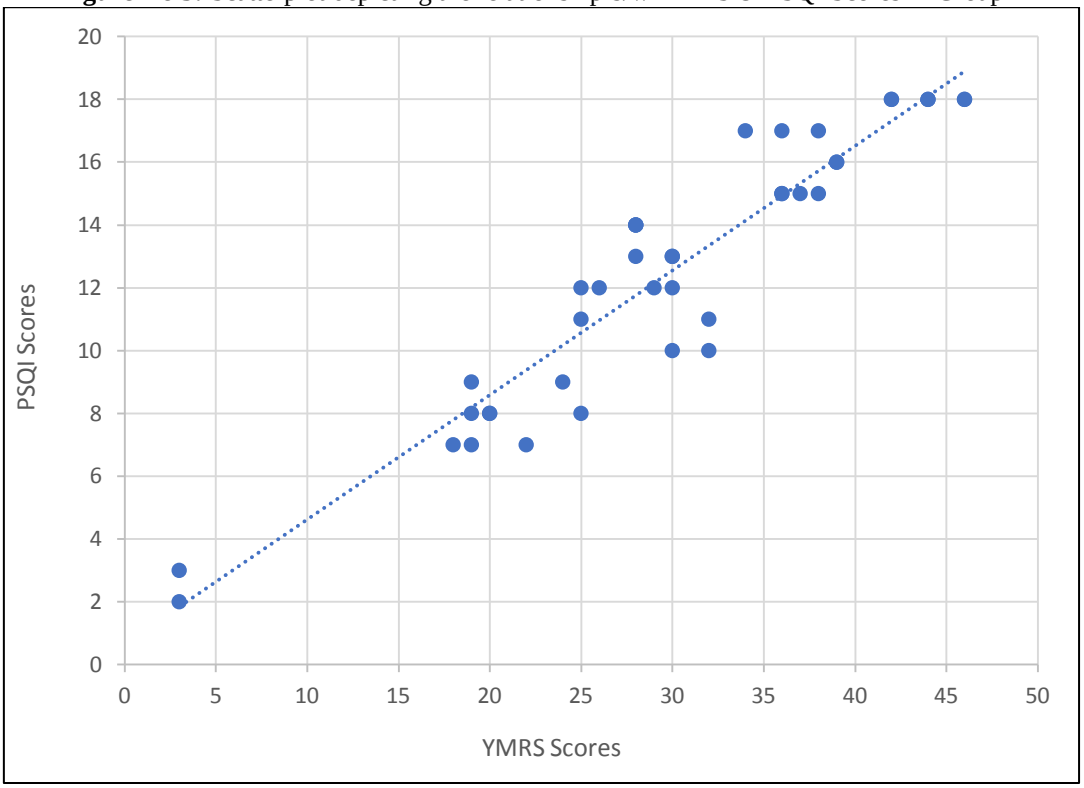
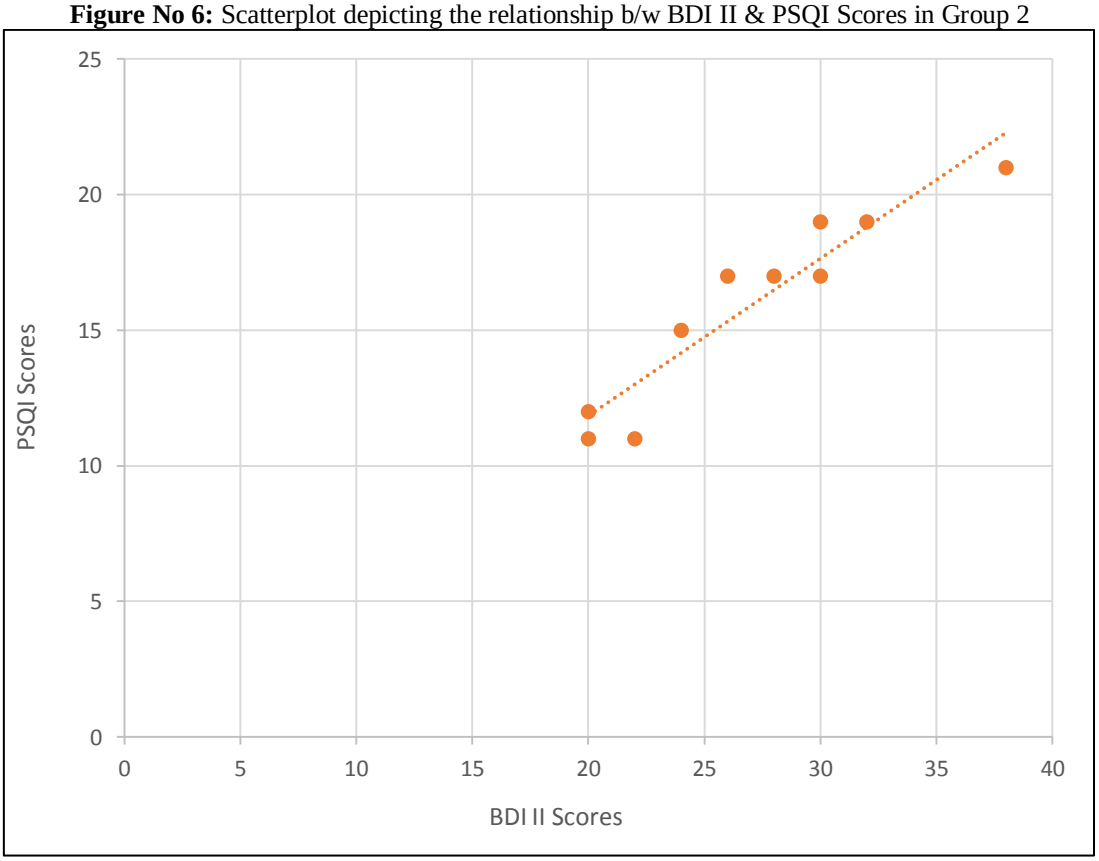


Figure No 6: Scatterplot depicting the relationship b/w BDI II & PSQI Scores in Group 2



IV. Discussion

In our study, the aim was to assess the nature of sleep disturbance in Bipolar patients and to detect the correlation between the severity of the bipolar disorder and sleep disturbance. The nature of sleep disturbance was assessed using Pittsburgh Sleep Quality Index (PSQI) which was applied separately for mania and depression patients. In this study, the patients with high scores on rating scales for mania (YMRS) and depression (BD II) were observed to be having higher sleep disturbance which was assessed by using PQSI. Sleep disturbance was found to be higher in depression patients as suggested by studies done earlier which depicted sleep disturbances were higher in depressive patients than in mania. There was a significant positive correlation between YMRS and PQSI and also there was a significant positive correlation between BD II and PQSI.

For the limitations of this study, our sample size is small compared to other studies with the sample taken from one tertiary/referral centre and hence, could not be generalized to primary care settings. The use of subjective measures of sleep disturbances and other psychometric tests instead of using objective measures such as actigraphy and polysomnography represents another limitation and points to the need to interpret the results with caution. The insight and judgment of the patients, or how much they understand the questionnaires could not be fully assessed and that might have led to some misinterpretations.

V. Conclusion

This study demonstrates the presence of subjective disturbance of sleep in patients with Bipolar disorder. These findings indicate that future studies should examine both the mean scores and the variability over extended periods using objective measures such as actigraphy and polysomnography. The PSQI may offer some advantages for routine practice and can provide reasonable approximations of sleep profile as well as daytime dysfunction. The overall findings suggest that more the severity of bipolar disorder higher the sleep disturbances in both mania and depression patients.

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