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A STUDY OF ROLE OF CO-MORBID DEPRESSION ON NEUROPSYCHOLOGICAL DEFICITS IN OBSESSIVE-COMPULSIVE DISORDER

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ABSTRACT

Introduction- Depression is commonly comorbid with OCD and There has been considerable interest in the neuro-cognitive functioning of subjects with depression, OCD and also depression with OCD since long time. The cognitive dysfunctions that have been demonstrated in the patients of OCD could in part be because of co-morbid depression.

Aim: To assess neuropsychological deficits in patients suffering from OCD & co-morbid depression, to compare the magnitude of neuropsychological deficits in OCD patients in relation to severity of co-morbid Depression

Methodology—it's a cross sectional study and included 72 patients of OCD having score < 20 on BDI scale with depression and OCD having score ≥20 on BDI scale who attending OPD at psychiatric Centre, Jaipur and Control group had 36 healthy persons matched for age and education. To enter in the study, patient was screened with a specially designed screening Performa, which encompassed the entire exclusion criteria, followed by application of various neuropsychological tests applied.

Results- We found that patients with OCD with moderate/severe depression showed higher neurocognitive impairment in domains of attention and working memory, verbal learning and delayed recall, visuso spatial recognition and memory, executive functioning, visuo constructual and visuo motor speed, shifting attention, perseverance, when compare to OCD with mild Depression.

Conclusion- Cognitive impairment was presents both in moderate/severe depressed as well as mild depressed OCD patients. But OCD with moderate/severe depression showed greater cognitive impairment than OCD with mild depression.

KEYWORDS : Cognitive impairment, depression, neuropsychological deficits

Introduction

In the 1980s, OCD was considered to be a rare disorder that was hardly responsive to treatment. With the advent of well-defined epidemiological studies, it has been shown that roughly about 2% of adults suffer from this disorder. [1]

This disorder has been listed among one of the ten most disabling illnesses by the World Health Organization .[2] And it is the fourth commonest mental disorder with disability in severe cases often comparable to the disability associated with mental illnesses such as schizophrenia and bipolar disorder. A major reason for disability in OCD is that patients often find it embarrassing to talk about their unwanted thoughts resulting in considerable delay in seeking treatment. [3]

Obsessive-Compulsive Disorder (OCD) is an intriguing and disabling illness characterized by the presence of obsessions (unwanted thoughts, images or impulses) and/or compulsions (repetitive behaviors). [4]

An obsession is a recurrent idea, image, or impulse that is perceived as being senseless, that is unsuccessfully resisted and that results in marked anxiety and distress. Common obsessional thoughts involve doubt, contamination, orderliness and symmetry, safety, physical symptoms, aggression, and sex.

A compulsion is a recurrent stereotyped behavior that is not useful or enjoyable but that reduces anxiety and distress. It is usually perceived as being senseless but is unsuccessfully resisted. A compulsive act may be a response to an obsessive thought or according to rules that must be applied rigidly. Common compulsive acts include washing and cleaning, arranging and ordering, checking, and other ritualistic behaviors; and mental rituals such as counting or repeating a phrase.

'Cognition' is the name given to mental process such as thinking, remembering, perceiving, planning and choosing. [1] Lezak 1995, defined cognition as "the information-handling aspect of behavior". Any degree of impairment in these processes results in cognitive impairment and cognitive deficits.

Cognitive deficits have been grossly addressed in three major domains of attention and information processing speed, memory and executive functions.

Cognitive deficits could be functioning as an intermediate variable between neurobiological abnormalities and OCD symptoms. Neuropsychological testing has revealed evidence of impairment in visuospatial abilities, [5] non-verbal memory [6] and executive function. [7] However, results of the neuropsychological studies have been inconsistent. Some report deficit in attentional set shifting abilities, response inhibition and trial and error learning. [8] The deficits in these neuro-cognitive domains have been shown to correlate with both the number of depression and obsessive compulsive disorder and overall duration of illness.

Depression is the most frequent complication of OCD, as reported in several studies. [9] In the Epidemiological Catchment Area (ECA) study, two thirds of those with OCD had a co-morbid psychiatric illness. [10] The most common concurrent psychiatric disorders were major depression (30-55%), social phobia (11-23%), generalized anxiety disorder (GAD) (18-20%), simple phobia (7-21%), panic disorder (6-12%), eating disorder (8-15%), tic disorders (5-8%) and Tourette's syndrome (5%). The Cross-National Epidemiological Study [12] also found high rates of anxiety disorders (24-70%), and depression (12- 60%).

MDD was 10 times more prevalent in OCD patients than in general population. [11] While up to 60–80% of patients with OCD experience a depressive episode in their lifetime, most studies agree that at least one-third of patients with OCD have concurrent MDD at the time of evaluation. [13], [14] Severity of OCD has also been strongly linked with depression. [15]

OCD could lead to depression for several reasons, including frustration with the illness and the experience of social stigmatization. [16] Patients with diagnosed OCD often experience an exaggerated sense of responsibility and guilt for their symptoms, which leads these individuals to blame themselves for their symptoms. [17]

Another reason why OCD could lead to depression is that anxiety-driven social withdrawal often results in isolation, peer rejection, loneliness, low self-worth and sadness. [18] A recent study by Anholt and colleagues showed that in a sample of 121 adults, changes in clinical OCD symptoms over a period of up to 5 years significantly predicted changes in depressive symptoms, but not vice versa. [19] Clinical OCD symptom severity [15], [20] and occupational disability [21] are heightened in populations with comorbid depression.

There has been considerable interest in the neuro-cognitive functioning of subjects with depression, OCD and also depression with OCD.

Abnormalities in executive function were related to comorbid depression severity and argued that conflicting findings in past studies regarding executive functioning are due to comorbid depression. [22] Depression is commonly comorbid with OCD. The cognitive dysfunctions that have been demonstrated in the patients of OCD could in part be because of co-morbid depression.

Methodology: Aim of the study:

1. **To assess neuropsychological deficits in patients suffering from OCD & co-morbid depression**
2. **To compare the magnitude of neuropsychological deficits in OCD patients in relation to severity of co-morbid Depression**

A cross sectional observational type study was carried out at Psychiatric Centre, SMS medical college & hospital, Jaipur. The study included consecutive patients of OCD (diagnosed as per ICD-10 diagnostic criteria) diagnosed by a junior resident and independently confirmed by a consultant psychiatrist. After taking written informed consent the patients screened and those meeting selection criteria were evaluated using "Y-BOCS".

Patients having Y-BOCS total score 8 or more were recruited in the study. The study subjects who were recruited were divided into two subgroups based on their Beck's Depression Inventory score. First subgroup included 36 patients of OCD having score < 20 on BDI scale with depression and the second subgroup also had 36 patients with OCD having score >20 on BDI scale.

Control group had 36 healthy persons matched for age and education who were taken from hospital staff and the general population.

An informed consent was obtained from the subject prior to participation in the study.

To enter in the study, patients were screened with a specially designed Performa which was based on the inclusion and exclusion criterion.

Those patients who satisfied the screening processes were recruited in the study. The patient's socio demographic data were recorded.

Selection Criteria for Cases

Inclusion criteria: - Age range 18-50 year, either sex, Literate enough to read and understand consent forms & questionnaires, Diagnosis of obsessive compulsive disorder according to ICD – 10 diagnostic criteria, Score on Y-BOCS rating scale ≥ 8

Exclusion criteria:- Any acute, unstable, significant, or untreated medical illness with special emphasis on neurological disorders, History of medical illness or neurological illness leading to cognitive impairment, History of significant head injury, Any Co morbid psychiatric illness other than major depression, Mental retardation (based on medical records or cognitive assessments conducted prior to current study), Current & past history of drug abuse or dependency problem, History of Color blindness

Selection Criteria for Control

Inclusion criteria: - Age range 18-50 year, either sex, Literate enough to read and understand consent form & questionnaires

Exclusion criteria: - Any acute, unstable, significant, or untreated medical illness with special emphasis on neurological Disorders, History of medical illness or neurological illness leading to cognitive impairment, History of significant head injury, past history of any psychiatric illness, Mental retardation, Current drug abuse or dependency problem, any of first-degree relatives having a lifetime axis-1 psychiatric disorder

Instruments of study

(1) Consent form
(2) Screening Performa
(3) Socio demographic profile
(4) Clinical profile Performa
(5) Yale-Brown Obsessive Compulsive Scale (Y-BOCS)
(6) Beck Depression Inventory (BDI)
(7) Neuropsychological tests: We gave the patient six test such as Digit span test, Verbal learning and memory test, Visual learning and memory test, Visuo-spatial working memory matrix, Stroop colour test, Trail making Test A & B

Statistical Analysis: Differences between the groups on demographic characteristics were examined using Student's T Test and analysis of variance (ANOVA) and post-hoc Tukey tests for the continuous variable and chi square test for the categorical demographic variables. All analyses were conducted in SPSS, version 20. $P < 0.05$ was considered statistically significant.

Results & Discussion

The socio-demographic characteristics of the OCD patients and the comparison group are presented in Table 1. Comparison groups were matched with regard to sex, age, marital status, occupation, education, location, marital status, family type and religion and there were no statistically significant differences across groups on these characteristics.

Table 1A: Comparisons of AGE among groups and ANOVA (Analysis of Variance) for AGE

Patients groups	N	Mean	Std. Deviation	ANOVA Test
OCD with mild Depression	36	28.78	8.816	
OCD with moderate/severe Depression	36	27.61	9.191	P= 0.667
Control	36	29.58	9.950	

TABLE 1B: Comparisons of SOCIO-DEMOGRAPHIC PROFILE among groups by using ANOVA

Variables	Total	OCD with mild Depression (n=36)		OCD with moderate/severe Depression (n=36)		Control (n=36)		X^2 (df)	p value
	No.	No.	%	No.	%	No.	%		
Sex									
1. Male	64	21	58.33	20	55.56	23	63.89	0.537 (2)	0.765
2. Female	44	15	41.67	16	44.44	13	36.11		
Marital Status									
1. Married	70	23	63.89	24	66.67	23	63.89	2.245 (4)	0.691
2. Unmarried	37	13	36.11	11	30.56	13	36.11		
3. Divorced/Separated	1	0	0.00	1	2.78	0	0.00		
Occupation									
1. Unemployed (including house wives)	52	17	47.22	18	50.00	17	47.22	0.932 (6)	0.988
2. Retired Pensioners									
3. Professional	0	0	0.00	0	0.00	0	0.00		
4. Businessmen	11	4	11.11	4	8.33	4	11.11		
5. Farmer / Skilled worker / Semi skilled worker / unskilled worker	23 22	7 8	19.44 22.22	9 6	25.00 16.67	7 8	19.44 22.22		
Education									
1. Up to Middle	31	9	25.00	12	33.33	10	27.78		
2. Middle to Sr. Secondary	45	18	50.00	15	41.67	12	33.33	3.214 (4)	0.523
3. Graduate / Post Graduate	32	9	25.00	9	25.00	24	38.89		

Income									
1. Nil – 6000	21	6	16.67	10	27.78	5	13.89		
2. 6001 – 15000	33	12	33.33	11	30.56	10	27.78	3.182 (4)	0.528
3. >15000	54	18	50.00	15	41.67	21	58.33		
Religion									
1. Hindu	101	34	94.44	34	94.44	33	91.67		
2. Muslim	7	2	5.56	2	5.56	3	8.33	0.306 (2)	0.858
3. Others	0	0	0.00	0	0.00	0	0.00		
Family								8.750 (4)	
1. Nuclear	42	11	30.56	10	27.78	21	58.33		
2. Nuclear Extended	42	16	44.44	16	44.44	10	27.78		0.068
3. Others	24	9	25.00	10	27.78	5	13.89		
Locality									
1. Urban	72	23	63.89	25	69.44	23	63.89	0.329 (2)	0.848
2. Rural	36	13	36.11	11	30.56	13	36.11		

Table 2: Comparisons of Type of onset of illness among the groups

Patients groups	Total	OCD with mild Depression (n=36)		OCD with moderate/severe Depression (n=36)		X^2 (df)	p value
	No	No	%	No	%		
1. Acute	24	12	33.33	12	33.33	0.062 (1)	0.803
2. insidious	48	24	66.67	24	66.67		

Table 3: Comparisons of Total Duration of Illness (TDI) (in years) among groups

Patients groups	N	Mean	Std. Deviation	P value
OCD with mild depression	36	5.44	4.385	
OCD with moderate/severe Depression	36	9.39	7.500	P=0.008

Table 4: Comparisons of YBOCS Score among the groups

Patients groups	N	Mean	Std. Deviation	P value
OCD with mild Depression	36	20.58	8.317	P=0.166
OCD with moderate/severe Depression	36	23.25	7.875	

Table 5: Comparisons of Neuropsychological domains score among the groups by using ANOVA

Neuropsychological domains	Mean	Std. Deviation	p value
FDST	5.36	0.639	<0.001
1. OCD with mild Depression	4.47	0.810	
2. OCD with moderate/severe Depression	6.00	0.956	
3. Control			
BDST	3.39	0.599	<0.001
1. OCD with mild Depression	2.94	0.715	
2. OCD with moderate/severe Depression	4.36	1.222	
3. Control			
Verbal LMT	54.94	17.277	<0.001
1. OCD with mild Depression	68.36	7.657	
2. OCD with moderate/severe Depression	51.92	13.546	
3. Control			
Visual LMT	41.17	8.443	<0.001
1. OCD with mild Depression	76.86	6.058	
2. OCD with moderate/severe Depression	39.94	9.450	
3. Control			
Visuo-spatial Matrix	3.86	1.693	<0.001
1. OCD with mild Depression	6.11	1.769	
2. OCD with moderate/severe Depression	2.86	1.606	
3. Control			
Color Stroop Test	116.83	17.122	<0.001
1. OCD with mild Depression	197.94	46.792	
2. OCD with moderate/severe Depression	85.00	26.184	
3. Control			
TMT-A	63.22	25.601	<0.001
1. OCD with mild Depression	85.72	34.381	
2. OCD with moderate/severe Depression	42.53	7.057	
3. Control			
TMT-B	146.42	42.715	<0.001
1. OCD with mild Depression	165.03	55.037	
2. OCD with moderate/severe Depression	84.97	22.618	
3. Control			

Table 6: Correlation of BDI with age, TDI and neuropsychological domains Scores

		Age	TDI	FDST	BDST	Verbal LMT	Visual LMT	Visuo-spatial matrix	CST- total time	Trail- A	Trail - B
BDI	Pearson Correlation	-.078	0. 242	-.488	-.415	.398	.503	.611	.610	.482	.452
	Sig. (2-tailed)	.420	0.04	.000	.000	.000	.000	.000	.000	.000	.000

Over the past several decades, a large and heterogeneous body of literature on the neuropsychology of OCD with depression has accumulated, yielding inconsistent results. The main focus of our study was to characterize and compare the neuro-cognitive profiles of patients suffering from OCD with mild depression and OCD with moderate/severe depression.

In our study table 1A compares the experimental group (OCD with mild depression and OCD with moderate/severe depression) and control group according to age. As in all these groups p-value is >0.05 on ANOVA test and table 1B compare groups on socio-demographic variables of sex, marital status, occupation, education, religion, family type and locality. As in all these groups p-value is >0.05 on ANOVA test thus the experimental and control groups do not differ significantly on these variables. Hence our samples' are comparable on age and these socio-demographic variables. Table 2 shows distribution of experimental groups on the basis of type of onset of disease. On chi square test p-value > 0.05, so both groups do not differ significantly according to onset of disease.

Table 3 shows total duration of illness in both groups. group OCD with mild Depression have mean duration of illness 5.44 years and the group OCD with moderate/ severe depression have mean duration of illness 9.39 years. On chi square test p-value < 0.05 so the mean duration of illness was greater in OCD with moderate/ severe depression group. In our study we said that patients who come in group OCD with moderate/ severe depression have higher mean duration of illness compared to patients who come in group which indicates that total duration of illness increased with increased severity of depression in OCD patients.

Table 4 shows comparison of YBOCS score between both groups. The results show that OCD with mild Depression have mean YBOCS score 20.58 and the group OCD with moderate/ severe depression have a score of 23.25. p-value > 0.05, so both the groups are comparable on this variable. In our study there was no significant difference, observed according to YBOCS score among the groups, that indicates OCD severity is not directly correlated with severity of depression.

Table 5 shows that OCD with moderate/severe Depression group performed poorly than OCD with mild Depression group on forward Digit Span Test (FDST) and backward Digit Span Test (BDST) who performed poorly than control group. The results shows Significant

difference (P < 0.001) on applying Post HOC analysis,TUKEY's test. In our study we found significant impairment in FDST and BDST domains which indicate significant deficits in short term memory, attention, concentration and verbal working memory and our result indicated that these deficits increased with severity of depression. That is, OCD with moderate/severe Depression group have more deficits on short term memory, attention, concentration and verbal working memory than OCD with mild Depression group. Our finding was supported by previous study i.e. Jeffrey Muller et al. 2003 found deficits in short term memory and attention, and also suggested impairment for non-verbal information. [23] And Kashyap H et al.2013 found deficits in scanning, planning time, concept formation, decision making and encoding of non-verbal memory in Subjects with OCD with comorbid depression. [24] Landro et al., 2001 found that patients showed significant impairment on attention and information processing related tasks which was consistent to the findings; it had been shown that OCD patients with comorbid depressive sympatomatology were impaired on effortful attention related tasks. [25] Delis et al., 1987, Deckersbach et al., 2000; Savage et al., 2000 found verbal and visual memory impaired when the stimuli were required to be semantically clustered to enhance encoding and later support the retrieval process, such as on the California Verbal Learning Test. [26], [27], [7]

Table 5 shows that OCD with moderate/severe Depression group performed poorly than OCD with mild Depression group on Verbal Learning and Memory test (verbal LMT) and Visual Learning and Memory test (visual LMT) who performed poorly than control group. The results shows Significant difference (P < 0.001) on applying Post HOC analysis,TUKEY's test. In our study we found significant impairment in verbal and visual LMT domains which indicate significant deficits in attention, visual learning and memory and our result indicated that these deficits increased with severity of depression. That is, OCD with moderate/severe Depression group have more deficits on attention, visual learning and memory then OCD with mild Depression group. Our finding was supported by previous study i.e. Saykin et al. 1994 who found Impairment in both immediate and delayed recall and individual subtests showed pronounced deficits on tasks related to verbal memory and learning (VBM), [28] Barnett et al., 1999; Dittrich et al., 2010; Nedeljkovic et al., 2009 found Spatial Recognition Memory deficit and most studies reported recognition impairment as a performance variable. [29], [16], [30] Another study which did not support our finding i.e. Watkins et al., 2005 did not find Recognition Memory deficit in neurocognitive domains. N. Y. Shin et al. 2014 found that Patients with OCD with comorbid depression were significantly impaired in tasks that measured visuospatial memory, executive function, verbal memory and verbal fluency, [31] Tallis frank et al. 1999 explained presence of non-verbal and praxic memory deficits in OCD, suggesting memory impairment in the OCD group.

Table 5 shows that OCD with moderate/severe Depression group performed poorly than OCD with mild Depression group on Visuo-spatial matrix test who performed poorly than control group. The results show Significant difference (P < 0.001) on applying Post HOC analysis,TUKEY's test. In our study we found significant impairment in Visuo-spatial matrix test which indicates significant deficits in visuo-spatial working memory and our result indicated that these deficits increased with severity of depression. That is, OCD with moderate/severe Depression group has more deficits on attention, visual learning and memory than OCD with mild Depression group. Our finding was supported by previous study i.e Porter et al., 2003 which said that Working memory was significantly impaired in OCD with moderate/severe depression patients when measured by BDST and visuo-spatial working memory test and it plays a crucial role in many cognitive tasks, such as reasoning, learning and understanding, these processes seem to be impaired in depression. [32] Deckersbach et al., 2000 found Impairments on tasks assessing verbal and visual memory, while significant differences between healthy controls and OCD with moderate/severe depression patient were apparent for Visuospatial Transformation and Block Design performance. [27] Kuelz et al., 2004, Mortiz et al. 2006 studied OCD with moderate/severe depression patients reporting more deficits with visual-spatial functioning than the OCD with depression and healthy control group. [33], [34] Another study Hodgson et al., 1999 also support a visuospatial memory impairment in OCD with comorbid depression which appears to be mediated by executive function deficits. [35] Sachin Sharma et al 2005 assessed the cognitive functioning of a group of patients with OCD with comorbid depression and a group of matched normal controls using Spatial Working Memory Test; they found significant impairment in OCD patients with comorbid depression. [36]

Table 5 shows that OCD with moderate/severe Depression group performed poorly than OCD with mild Depression group on color stroop test (CST) who performed poorly than control group. The results shows Significant difference (P < 0.001) on applying Post HOC analysis,TUKEY's test. In our study we found significant impairment in color stroop test (CST) which assessed more specifically susceptibility to interference and inability to inhibit inappropriate automatic responses, our results indicated significant deficits in susceptibility to interference and inability to inhibit inappropriate automatic responses which increased with severity of depression. That is, OCD with moderate/severe Depression group have more deficits on susceptibility to interference and inability to inhibit inappropriate automatic responses than OCD with mild Depression group. Our finding was supported by previous study i.e. Hartston HJ et al 1999 and R. Tükel et al. et al 2012 who found inconsistent findings of inhibition deficits on the Stroop task, a task for assessing complex selective attention and interference control as an executive function, indicated that the OCD with moderate/severe depression group showed poorer performance than the control group, resulting in impairment of cognitive inhibition on Stroop task in OCD patients. [37], [38] Another study Schmidtke K et al.1998 found no significant differences on the Stroop task in OCD patients. Mullers et al 2005, Enright and Beech 1993 showed that the OCD group with comorbid depression displayed poorer performance on stroop test. [23], [39] Aycicegi A et al. 2003 studied OCD patients with comorbid depression and demonstrated performance deficits on measures of delayed memory, response inhibition, alternation learning, and obtained significantly higher scores on measures of disinhibition, impulsivity, and temporolimbic symptoms. [40]

Table 5 shows that OCD with moderate/severe Depression group performed poorly than OCD with mild Depression group on Trail Making Test – A (Trail-A) and Trail Making Test –B (Trail-B) who performed poorly than control group. The results shows Significant difference (P < 0.001) on applying Post HOC analysis,TUKEY's test. In our study we found significant impairment in Trail Making Test- A and B which indicate significant deficits in visual attention, planning and sequential behavior, initiating and choosing behaviors, and cognitive flexibility and our result indicate that these deficits increased with severity of depression. That is, OCD with moderate/severe Depression group had more deficits on visual attention, planning and sequential behavior, initiating and choosing behaviors, and cognitive flexibility than OCD with mild Depression group. Our finding was supported by previous study i.e Penadés et Al 2005 and R. Tükel et al. 2012. Studies demonstrated that the performance of the OCD with moderate/severe depression group was slower on the TMT-A than the control group. And the performance of the OCD with moderate/severe depression group was also poorer in the second part of the TMT-B. [41], [38] Grant et al.,2001, Fossati et al.,2001, Castaneda;2008, Reppermund S. 2009 also reported marked impairment in executive functioning which includes cognitive flexibility, planning and sequential behavior and attentional switching. [42], [43], [44], [45] Purcell et al., 1998; Savage et al., 1999 found that OCD patients shows specific deficits in executive functioning with comorbid depression, Executive functioning was measured by TMT-B and Stroop interference score. [46], [6] Enright, Beech, & Claridge, 1995 shows preattentive deficit in cognitive inhibition on neuropsychological domains. [39] Hashimoto N et al 2011 supported that scores on the symmetry/ordering dimension were associated with poorer performances on the Learning Memory and Trail Making tests in Patients with OCD with comorbid depression. Adriano et al 2011 they found poor performance in memory and attentional tasks and also found deficits in set-shifting, planning and verbal fluency in patients with OCD with comorbid depressive symptomology. [47] Basso MR et al 2001 examined the relative impact of depression on executive function deficits in OCD patients; they measured executive function and found deficit in it. It suggested that abnormalities involving executive function in OCD are related to co-morbid depressive severity. [22] Steffen Moritz et al. 2002 administered several executive tasks (Wisconsin Card Sorting Test (WCST), verbal fluency, digit span, Stroop, and Trail-Making) in OCD patients with depressive symptomology and found Dysfunctions in the domains of working memory, verbal fluency, distractibility, and concept formation. [48]

In our study table 6 shows that neurocognitive impairment was

positively correlated with severity of depression in both OCD with moderate/severe depression and OCD with mild depression. A significant positive correlation existed between Beck Depression Inventory (BDI) and neuropsychological domains such as forward digit span test (r= -0.488, p < 0.001), backward digit span test (r= -0.415, p < 0.001), verbal learning and memory test (r= 0.398, p < 0.001), visual learning and memory test (r= 0.501, p < 0.001), visuo-spatial working memory matrix test (r= -0.611, p < 0.001), stroop colour test (r= -0.610, p < 0.001), Trail making Test- A (r=0. 482, p < 0.001) and Trail Making Test-B (r=0. 45, p < 0.001) by using Pearson's correlation coefficient. In OCD with moderate/severe depression in all domains of neurocognition correlation was significant and neurocognition was impaired in all cognitive domains like attention and working memory (digit span test), verbal learning and delayed recall (verbal learning and memory test), visuo spatial recognition and memory (visual learning and memory test and visuo-spatial working memory matrix test), executive functioning (stroop colour test), visuo constructual and visuo motor speed, shifting attention, perseverance (Trail making A and B test).

Similar result was found with a meta-analysis by Burt et al in 1995 that revealed significant, stable association between depression scoring (BDI) and memory impairment. [49] Further analyses indicated, however, that it is likely that depression is linked to particular aspects of memory, the linkage is found in particular subsets of depressed individuals, and memory impairment is not unique to depression. Hammar et al 2003 in which 21 patients with HAM-D >18 were investigated within a neuro-cognitive experimental setting. The results showed that the higher depression scoring patients had an impaired performance for effortful, visual search performance, and that the impairment remained after 6 months, despite significant improvement in their depression scores. In an another meta-analysis of depression severity and cognitive functions by McDermott and Ebmeier in 2009, significant correlations between depression severity and cognitive performance were found in the domains of episodic memory, executive function, and processing speed, but not for semantic memory or visuo-spatial memory. For both timed and un-timed cognitive measures there were equally significant correlations with depression severity.

The negative effects of comorbid depression on cognitive function in OCD have been investigated by several authors. It was demonstrated that higher depression scores were associated with greater executive deficits in OCD et al. [49], [22]

Neuropsychological deficits were specific to OCD with moderate/severe Depression patients exhibited similar or worse complaints than OCD with mild depression patients. Although some of the dysfunctions reported by OCD patients were highly correlated with the degree of OCD symptomatology, strong correlations also emerged with depressive symptomatology. This suggests that subjective cognitive dysfunctions are associated with overall rather than specific psychopathological morbidity (depression). [34]

It has been argued that cognitive impairment in depressed patients is more strongly related to depression severity [50] and that depressed patients exaggerate their deficits. [34] Despite these reservations, those domains reported to be dysfunctional by depressed patients, in other study, they have been shown to be impaired with neuropsychological instruments. [51]

In our study patients with OCD with moderate/severe depression performed significantly worse on all cognitive tasks i.e. when compared to OCD with mild depression and control groups. These deficits did not correlate with the demographic data or clinical characteristics.

Thus results of our study suggest that Neuropsychological deficits are common in patients suffering from OCD & co-morbid depression and the magnitude of neuropsychological deficits is greater in OCD patients with greater severity of co-morbid depression"

In our study we could not control for effects of medication on the cognitive functions. But the results of treatment on cognition have been mixed in earlier studies. Some authors report improvement in certain cognitive domains like cognitive flexibility with treatment [52], [53] while other cognitive domains like verbal learning and memory are negatively affected. [53]

Conclusion: - Following conclusions were drawn from the present study.

1. Cognitive impairment was present both in moderate/severe depressed as well as mild depressed OCD patients.
2. OCD with moderate/severe depression showed greater cognitive impairment than OCD with mild depression.
3. The neurocognitive impairment was present in all cognitive domains like attention and working memory (digit span test), verbal learning and delayed recall (verbal learning and memory test), viuso spatial recognition and memory (visual learning and memory test and visuo-spatial working memory matrix test), executive functioning (stroop colour test), visuo constructual and visuo motor speed, shifting attention, perseverance (Trail making A and B test)

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