

## Cognitive Dysfunctions in Depressive Patients

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### ABSTRACT:

Cognition is the word often used to describe the fundamental capacity to think. Its disturbance in depression is probably what most bothers patients and their families and not the symptoms, they are usually used to measure and diagnose the condition. It has also become clear that depression has an enduring impact on memory function, attention and other domains of cognition with major implication for neurological explanation of depression. Cognitive functions have thus become an increasingly central target for emergent interest and relevance. These developments have also reignited interest in patient experience and the possibility that may be blunted in depression, but also as a consequence of its treatment. Past studies on depression have documented cognitive dysfunctions significantly.

**Aim-** In this study an attempt was made to assess and compare the cognitive impairment in depressive patients and normal subjects. **Methodology-** The sample was selected from Ranchi Institute of Neuro-Psychiatry and Allied Sciences (RINPAS). Hindi adaptation of Cognitive Symptoms Checklist and Beck Depression Inventory were administered on 50 depressive patients and 50 normal controls. **Results** of the study suggest significant difference in cognitive functions between depressive patients and normal subjects. Depressive patients showed more deficits in Attention, Memory and Executive Functioning on Cognitive Symptoms Checklist (CSC) than normal controls.

**Keywords:** *Cognitive symptoms, Depression, Cognitive Dysfunction*

### INTRODUCTION:

Mental illness affects many people, but what most do not realize is that it does not just cause emotional problems - it causes cognitive problems too. The person with mental illness may find it difficult to think clearly, pay attention and remember. Cognition refers to the thinking skills, the intellectual skills that allow the person to perceive, acquire, understand and respond to information. These include the abilities to pay attention, remember, to solve problems, to organize and recognize information, to communicate and to act upon the information. There are different mental illnesses and they affect cognition differently. Furthermore, not every person is affected in the same way, some person with depression have more cognitive problems than others. Some people have problem in one aspect of cognitive functioning but not in another. It is important to understand that a mental illness affects each person differently.

Word limit & how we think, like depression entails tiredness and pale expression of what they purport to describe. Depression is "a wimp of a word" according to William Styron, describing his own experience in *Darkness Visible*; "A Memoir of Madness". We may also be too familiar with the idea that depression is a constellation of symptoms rather than a profound disturbance of cognition. The word cognition (or cognitive) refers, to the action or faculty of knowing, a fundamental human activity. At its simplest it

equals the thinking. The investigation of cognition divides into two broad approaches, depending upon how explicitly we include emotional valence as a key experimental variable. The best known approach to attention, memory and executive function has traditionally tested such functions independently of emotion. One may ask whether mood disorder is associated with abnormal orientation or allocation to stimuli and whether attention can be normally sustained.

Depression is one of the most common disabling disorder worldwide. The depressed person appears to lose capacity in somatic, cognitive, emotional and social spheres. Depression has been approached in the past as a state of mind, a clinical diagnosis or a syndrome. Its conceptualization as a state of mind offers such an array of problems that it is rendered useless for most research purposes. Considering depression as a diagnosis has led to elevation of a concept that offers some problems as modern nosological criteria such as DSM-IV<sup>1</sup> or ICD-10<sup>2</sup>. Currently this concept is defined as a particular constellation of symptoms. The selection of the symptoms that define depression has been determined by large field and epidemiological studies, rendering its operational definition reliable, but its validity is less clearly characterized.

Although generalized impairment in most cognitive domains can be seen in acute depression, selective attention appears to be prominently impaired, and may predict response to treatment, remission of symptoms and risk of relapse<sup>3</sup>.

Depressed patients show deficits in automatic attentional processing, memory scanning and memory span, which altogether suggest a reduced speed of information processing in automatic subtasks.

The type of cognitive impairment varied according to the depression subtype, so that patients with major depression and mixed anxiety- depressive disorder exhibited significant memory dysfunction, whereas individuals with dysthymia showed pronounced difficulties in mental flexibility. Minor depression did not affect cognitive performance. Verbal fluency and perceptual- motor speed were not affected by depression. This indicates that specific types of depression may carry specific types of neuropsychological dysfunction. However, the interpretation of experimental data is limited because of the paucity of normative data on the cognitive aspects of depression. Major depressive group performance is poorer than control group in tests of attention and executive functions (TMT) and verbal short term memory (CVLT). Bipolar depressive group performed poorer than control group in verbal memory (CVLT) and attentive and executive functioning (BSAT, SCWIT, TMT). Bipolar depressive group performed poorer than major depressive group in tests of verbal memory and executive functioning. The performance of major depressive disorder group was poorer than control group in attentive tests (Cancellation Test, Digit Span, Digit Symbol, TMT: A). Psychotic major depressive disorder group performed poorer than control group in tests of executive functioning (COWAT, SCWIT, TMT: B, WCST) and motor skills (FTT, GPT). Psychotic major depressive disorder group performed poorer than non- psychotic major depressive disorder and control groups in a test of visual memory (Visual Reproduction). Major depressive disorder group and control group did not differ in verbal memory (CVLT).

The aim of the study was to assess the cognitive symptoms of patients with depression. The main objectives were to determine the cognitive symptoms of patients with depression and to find out correlation between clinical variables and cognitive symptoms of patients with depression.

#### **METHODOLOGY:**

The present study is a cross- sectional hospital based study, was conducted in Ranchi Institute of Neuro-Psychiatry and Allied Sciences (RINPAS). Sampling was done by purposive sampling technique. Sample was comprised of 50 patients with depression and 50 normal subjects. Patients with depressive disorders who were treated at RINPAS, age range 18 to 45 years, both sexes having duration of illness minimum six months or at least two episodes of illness were selected for the study. Patients

with history of any other psychiatric disorders, head injury and mental retardation and uncooperative patients were excluded from sample. In normal group, normal persons who scored one or zero in GHQ-5 and cooperative for tests were selected. Written consent was taken from both groups.

#### **TOOLS USED:**

Socio-demographic and clinical data sheet- A socio demographic and clinical data sheet was specially designed to record demographic and clinical variables of the subject, such as age of onset, duration of illness, family history etc.

**General Health Questionnaire - 5** (Shamsunder et al.) - The short version of original GHQ developed by Goldberg and William in 1988, was administered on normal controls to rule out any psychiatric morbidity. GHQ - 5 is a short version of the General Health Questionnaire, which consists of 5 items. The suitability of short version is because of it is less time consuming and better screening instrument.

**Beck Depression Inventory** (Beck et. al.) - The BDI is a 21-item, self administered inventory that asks patients to rate how intense their experience of attitudes and symptoms of depression has been over the past week. Each item in the inventory consists of for self- evaluative statements scored 0 to 3, with increasing scores, indicating greater severity of depression.

**Cognitive Symptoms Checklist** (Hindi Adaptation) - The original Cognitive Symptoms Checklist (CSC) is developed by Christiane O'Hara et al. It is used to identify the problems in daily living skills under the heading of attention/ concentration, executive functions, memory, visual process, and language. These cognitive domains further subdivided.

The domain of attention and concentration is further subdivided into the areas of internal distracters (physical/ emotional), external distracters (visual, auditory and environmental), sustained attention, divided attention and simultaneous attention.

Executive function was divided into following headings- processing speed/reaction time, initiation/follow through, self correction, mental flexibility, planning, sequencing, problem solving, organization and reasoning.

The domain of memory is further subdivided into activities of daily living, medicine, nutrition/food preparation, sequence, safety, routines, money management, spatial relationships, time and receptive language.

The domain of visual process is divided into vision, visual field/neglect scanning, discrimination, figure/ground, mental imagery, spatial relationship and organization.

Language was further subdivided into the following headings- hearing, speaking, receptive language (auditory), receptive language (written), executive language (speaking) and expressive language (writing).

Cognitive Symptoms Checklist (Hindi Adaptation) was developed and translated by RINPAS, and used for present study to assess the cognitive symptoms.

**PROCEDURE:**

After screening, according to the above mentioned inclusion and exclusion criteria, patients were selected for the study. Clinical history was taken and socio- demographic and clinical data sheet was filled. Beck’s Depression Inventory (BDI)9 was applied to assess the severity of depression and Cognitive Symptoms Checklist was administered to assess the cognitive symptoms in the subjects. Mean and SD were calculated with the help of SPSS 10.0 version.

**RESULTS:**

The aim of the study was to assess the cognitive symptoms of patients with depression. *Sample Characteristics-* In depression group, majority of the sample were male (78%), married (68%), educated up to intermediate (62%), and unemployed (50%). In normal group, majority of the sample were male (72%), married (54%), educated up to intermediate (70%) and unemployed. The mean age of depression group was 30.16 years and normal group was 29.44 years.

**Table1: Showing Comparison between Depression and Normal Group Subjects in Attention Scale**

Variables	Depression Group		Normals		t- value
	Mean	SD	Mean	SD	
Attention Span Thinking Task	46.500	23.867	48.300	17.485	.430
Attention Span Physical Task	60.000	23.66	87.12	21.71	6.452**
Internal Distractor Physical	2.200	.6061	.5400	.7060	12.616**
Internal Distractor Emotional	2.4800	1.3738	.5102	.5818	9.256**
External Distractor Visual	.8800	.8241	.4600	.6764	2.786**
External Distractor Auditory	1.2400	1.0606	.4800	.7887	4.066**
External Distractor Environmental	.5200	.7351	.5400	.7060	0.139
Sustained Attention	3.3800	1.4693	1.9600	1.3242	5.076**
Divided Attention	2.2200	.9957	.7200	.6213	8.333**
Simultaneous Attention	2.1000	.7354	.7000	.6776	9.899**
Attention And Concentration Scale	15.1600	4.6351	5.9000	2.7274	2.1750**

\*\*Significant on level .01

**In Table 1**, in the domain of attention and concentration subscale, significant difference was evident in attention span (physical task), internal distractor (physical), internal distractor (emotional), external distractor (visual), external distractor (auditory), sustained attention, Divided attention, simultaneous attention and full subscale. In these areas depression group showed significant deficits compared to normal group. However, the areas of attention span (Thinking task), the mean scores were found higher in depressive group and in the area of external distractor (environmental), mean scores were found higher in normal groups but no significant difference between the groups was found.

**Table 2: Showing Comparison between Depression and Normal Group in Memory Scale**

Variables	Depression		Normal		t-value
	Mean	SD	Mean	SD	
Medical	.4200	.6728	.0000	.0000	4.414**
Food	1.1000	.7671	.1000	.3030	9.191**
Safety	.2200	.4185	.1000	.1414	3.202**
Daily Routine	.3400	.5194	.1000	.4785	3.102**
Money Management	.9000	.9742	.1000	.1414	6.321**
Spatial Relationship	.6400	.7217	.1450	.3505	4.407**
Time	1.5600	1.0529	.3800	.4903	7.184**
Receptive Language	1.2600	1.0264	.2200	.4185	6.635**
Expressive Language	.5600	.7866	.2600	.4870	2.293*
Personal	.9600	.3476	.4600	.5035	5.779**
Memory Scale	7.1800	4.4341	1.6400	1.6132	8.302**

\*\*Significant on level .01

\*Significant on level .05

In the domain of memory subscale, patients with depression expressed significant deficit in areas of medical, food, safety, daily routine, money management, spatial relationship, time, receptive language and personal at level of 0.01 and on expressive language both the groups significantly differs at 0.05 level.

**Table 3: Showing Comparison between Depression and Normal Group in Executive Functioning Scale**

Variables	Depression		Normal		t-value
	Mean	SD	Mean	SD	
Processing Speed	3.1400	1.1954	.6200	.6667	13.019**
Initiation Follow	1.3200	.5869	.2600	.4431	10.192**
Self Correction	1.6600	.6581	.1200	.3283	14.807**
Mental Flexibility	1.1600	.6809	.2200	.4185	8.316**
Planning	1.8000	1.4983	.3000	.5803	6.601**
Sequencing	1.7200	.8816	.2000	.4518	10.850**
Problem Solving	2.2200	1.2337	.5800	.8104	7.856**
Organization	1.4800	.5799	.3400	.4785	10.721**
Reasoning	2.2400	1.2545	.1000	.3642	11.584**
Executive Functioning Scale	16.7400	5.9541	2.7200	2.0004	17.065**

**\*\*Significant on level .01**

In the domain of executive functioning subscale, depressive patients exhibited significant deficits in comparison of normal subjects. The significance level was found at 0.01 level in the areas of processing speed, initiation follow, self correction, mental flexibility, planning, sequencing, problem solving, organization, and reasoning. Overall scale scores also found significant different between both the groups. Depressive group showed more dysfunctions in all the areas of executive functioning when compared to normal subjects.

**Table 4: Showing Comparison between Depression and Normal Group in Visual Processing Scale**

Variables	Depression		Normal		t-value
	Mean	SD	Mean	SD	
Vision	.7200	1.0309	.1200	.3283	3.921**
Visual Field	1.9000	.1979	.0000	.0000	1.429
Scanning	.4400	.7866	.1000	.3030	2.852**
Discrimination	.1200	.3283	.0000	.0000	2.585*
Figure Ground	.3400	.4785	.0000	.0000	5.024**
Mental Imagery	.1800	.4375	.1100	.1414	2.460*
Spatial Relation	1.4600	1.1104	.0000	.0000	9.297**
Organization	.5000	.7354	.0000	.0000	4.808**
Visual Processing Scale	3.9200	2.5382	.2400	.6247	9.955**

**\*\* Significant on level .01**

**\*Significant on level .05**

In visual processing domain, significant difference was found in areas of vision, scanning, figure ground, spatial relation and organization at level 0.01, and areas of discrimination and mental imagery were found significant at level 0.05. However the mean value of depressive groups was found higher in visual field area but difference was not significant.

**Table 5: Showing Comparison between Depression and Normal Group in Language Scale**

Variables	Depression		Normal		t-value
	Mean	SD	Mean	SD	
Hearing	.7400	.7775	.3200	.6528	2.925**
Speaking	.2400	.5175	.0000	.0000	3.110**
Receptive Language(Auditory)	.5200	.6141	.0000	.0000	5.987**
Receptive Language(Writing)	.1414	.1999	.0000	.0000	1.429*
Expressive Language (Speaking)	1.1600	.9765	.1410	.2828	7.790**
Expressive Language (Writing)	.9800	1.05593	.0000	.0000	6.542**
Language Scale	3.6800	2.3599	.3600	.6928	9.545**
Csc Total Scale	47.2800	13.4605	10.7400	4.5437	18.187**

**\*\* Significant on level .01**

**\* Significant on level .05**

In language subscale, depressive patients showed significant deficit than normal group in areas of hearing, speaking, receptive language (auditory), expressive language (speaking), and expressive language (writing) significant level at 0.01 level and only one area receptive language (writing) was significant at 0.05 level.

**Table 6 - Showing Correlation between Cognitive Symptoms Checklist (CSC) Score and Beck Depression Inventory (BDI) Score with Clinical Variables**

Variables	CSC score	BDI score	Age	Onset	Duration of illness
CSC Score	_	.710	.083	.115	.090
BDI Score	.710	_	.041	.091	.223
Age	.083	.041	_	.985**	.487**
Onset	.115	.091	.985**	_	.357*
Duration Of Illness	.090	.223	.487**	.357*	_

**\*\*Significant at the 0.01 level**

**\*=**

## Significant at the 0.05 level

The table 6 shows that age is significantly correlated with onset at illness and duration of illness respectively ( $r = .985$ ,  $r = .487$ ). Onset at illness is significantly correlated with only duration of illness at the 0.05 level ( $p = .357$ ).

## DISCUSSION:

The families often ask what causes the cognitive problems. Rorschach has shown that it is the illness themselves that cause much of the cognitive dysfunction. For many years people thought that the cognitive problems were secondary to other symptoms, like psychoses, lack of motivation, or unstable mood- but now we know that is not the case. Cognitive dysfunction is a primary symptom of severe affective disorder and schizophrenia, that is why the cognitive problems are evident even when other symptoms are controlled even when people are not psychotic, or in an affective episode. Furthermore, the research has shown that those part of the brain that are used for specific cognitive skills, often do not function normally in people with schizophrenia and certain affective disorders. This indicates that mental illness affect the way of the brain functions and that is what causes the cognitive problems.

The aim of the study was to assess the cognitive dysfunctions/symptoms of patients with depression. There is a significant difference in cognitive symptoms between depressive patients and normal subjects. Depressive patients showed more deficit in Attention, Memory and Executive Functioning domains of Cognitive Symptoms Checklist (CSC) than normal controls.

Overall findings exhibited that depressive patients showed significant deficits in areas of attention, memory, executive functioning, visual processing and language. These findings are consistent with the earlier studies<sup>12</sup>.

In the domain of attention and concentration significant differences between depressive and normal groups in different areas was found. Individuals with depressive disorder have shown difficulty on focusing the proper attention on some particular task and poor information processing which is well documented in various studies conducted in this area. These findings may consistently be interpreted in the light of difficulty of focusing and/or shifting the attention in individual suffering from the depressive or any other major mental health problems and these findings are supported by several recent studies. Depressive patients have shown deficits on a variety of attention related tasks<sup>12, 13, 14</sup>, though the nature of the

impairment is difficult to define as various studies investigate different aspects of this concept<sup>15, 16</sup>. Moreover, attention is closely related to other cognitive domains, especially psychomotor speed and executive functioning. It has been suggested that attention can be divided into processing speed, selective attention and automatic processing; selective attention being a part of executive functioning person face difficulty on planning and execution of multi tasking<sup>17, 18</sup>. People who have affective disorder like bipolar disorder and recurrent depression often experience problem in the area of ability to pay attention, ability to remember or recall information, ability to think critically. All these problems in the domain of attention may be evident during the depressive episodes. But when the mood stabilizes most often the problem with attention gets better but some studies report contrary findings<sup>19</sup>.

The depressive patients exhibited more deficits in memory area than normal controls. The deficits in the area of memory in depressive groups may be caused by poor attentive processes, poor ability to register the new information because of the person suffering with major depression remains interwoven with negative thought process and social withdrawal. The impairment in memory and problem solving are associated with greater problems if living independently. In fact it has been shown that for the people with MDD and schizophrenia, cognitive abilities are more linked to successful independent living and quality of life than clinical symptoms. It is easy to understand that the ability to solve problems and remember verbal information is critical for negotiating with routine life process and rehabilitation. The findings in present study are consistent with findings reported as regards an association between depression and memory impairments<sup>20, 18, 13, 5, 21, 22</sup>. In contrast there are studies reporting primarily no impairment in depressive patients on tasks assessing memory<sup>23, 24, 25, 26</sup>.

Critical thinking, planning, organization and problem solving are often referred to by neuropsychologist as the executive functions as because those are the skills that help the individuals to act upon information in an adaptive way. People with mental illness may seem less able to think of alternative strategies for dealing with problems that arise, or they may have difficulty coming up with plan, or find it difficult to listen critically to new information. The result of present study shows that depressive patients group performed poor in executive functioning domain. In some previous studies, executive functioning deficits have been shown by depressive patients on tests measuring problem solving and planning<sup>27</sup>, mental flexibility<sup>26, 5</sup>, verbal fluency<sup>28, 29</sup>, decision making<sup>30</sup> and working memory<sup>31, 27, 29, 30, 32, 33</sup>.

or the ability to inhibit one source of information and at the same time facilitate processing of another source of information<sup>34</sup>. More specifically it has been suggested that the inability to shift mental set is the most prominent executive functioning impairment in major depressive disorder patients<sup>35</sup>. Opposed to these findings, others have reported depressive patients to show normal performances in multiple aspects of executive functioning<sup>36,37</sup>.

The result of this study is consistent with previous findings suggesting residual impaired performance of executive functions of MDD cases. Recent functional neuroimaging studies have suggested that the Prefrontal Cortex (PFC) and the Anterior Cingulate Cortex (ACC) are particularly impaired in depressive patients. In addition, studies documented that dysfunction of PFC, ACC and Amygdala may remain even in a remitted state, suggesting pathological influence within fronto sub cortical network<sup>38</sup>. Within such functional abnormalities of PFC, ACC, and Amygdala projection one can consider that dysfunction of ACC is most crucial and in pathogenesis of MDD and reasonably persist in remitted range too. Recent fMRI studies using stroop task paradigm demonstrated in deficiency of ACC and dorsolateral PFC in Major Depressive Disorder<sup>39</sup>. Findings of present study together with those of Paelecke – Hagerman are in line with such fMRI experiment suggesting residual psychopathophysiological dysfunction of the Anterior Cingulate Cortex (ACC) which is most sensitively indexed by poor stroop task performance. Most of the studies investigating the association between depression and cognitive dysfunction, executive functions seem to be key factor of Major Depressive Disorder (MDD)<sup>40</sup>. Since most of the studies have found patients with depression to manifest deficits in several subcomponent of executive functioning. Major depressive disorder (MDD) seems to relate also with attentional deficits<sup>41</sup>, short term and working memory impairment in both verbal and visual task dysfunction in psychomotor skills<sup>8</sup>. Some studies have observed clear verbal memory impairment among depressed patients compared to healthy controls<sup>42</sup>.

Table: 4 suggests that depressive patients group have more deficits in visual processing area than normal group. In the area of language, depressive patients performed more poorly in comparison to normal control. Neuropsychological and functional neuroimaging studies has documented that language is tightly linked with the left prefrontal cortex (PFC) including Broca's and adjacent areas together with premotor cortex and insula<sup>41</sup> in addition PET and fMRI studies has suggested that not only the left but also the right frontal lobe, may play a crucial role in voluntary speech

intension and/ attentional resources. Interconnected areas such as those are implicated in organizing a functional language network subserving word output. In the present study the language scale scores were found to be poor can be correlated to the presence of white matter lesions. This suggests that the vascular lesions associated with depression may lead to impairment of the language related to frontal lobe functions.

There was no significant correlation between clinical variables and cognitive symptoms of patients with depressive disorders; however, age is significantly correlated with onset at illness and duration of illness respectively. Onset at illness is significantly correlated with only duration of illness at the 0.05 level.

## CONCLUSION:

When people have difficulty in paying attention, remembering and thinking clearly it impacts on their ability to function in the community, at work and in relationship. Impairment in ability to pay attention, be focused and not get distracted is important for social functioning. In conclusion, patients with depressive disorders have significant deficits in cognitive functioning or symptoms, in areas of attention and concentration, memory, executive functioning, visual processing and language. Patients cognitive functioning and the impact this has on daily life functioning should be a focus in ongoing treatment. Impaired cognitive functioning affects family life, school performance, work performance and social life. Cognitive training and rehabilitation could prove importance in treating depression in the long-term course, and help prevent relapse. A simplest cognitive impairment may associate with depressive disorder with clear cut impact on social and occupational functioning. People with mental illness may seem less able to think of alternative strategies for dealing with problem that arise or they may have difficulty coming up with a plan or find it hard to listen critically to new information and know what is important and what is not. Moreover, enduring cognitive dysfunction has a strong clinical significance in these often progressive disorders, since it may reduce coping abilities, make the patient more prone to relapse and affect treatment outcome. Furthermore it remains unclear as to what extent cognitive deficits precede the depressive disorder and to what extent they develop subsequent to disorder onset. Why some patient have sever impairment in cognition, some mild while others remain in normal range, remain unclear too, and this can be solved only by the identifying disorder subset and characteristics that associate with cognitive impairments. Furthermore, it is unclear as to whether,

cognitive dysfunction in depression represent state or trait factors or both. It would be essential to determine whether cognitive deficits are the result of progressive affects over the course of the illness or whether these deficits preceded the onset of the illness. Accordingly, prospective studies starting from young adulthood or even earlier are needed to solve these clinically important questions and to expand the knowledge in to clinical practice.

### LIMITATIONS AND SUGGESTIONS:

In this study, the numbers of female subjects were less in the samples, so findings were may not be generalized on female population. Thus, a large sample size can be used in the future study to obtain the results which can be generalized to the female patients with depressive disorders. It was mostly subjective reports by the patients which is liable to biasness.

Other neuropsychological tests or scales may be incorporated in the study for a more elaborated assessment of cognitive functioning and its impact on psychosocial functioning and psychotherapeutic outcomes.

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