

Original research article

## **A COMPARATIVE STUDY OF NEUROCOGNITIVE IMPAIRMENT BETWEEN EARLY-ONSET & LATE-ONSET SCHIZOPHRENIA**

### **1st author**

**Dr. A. Kowsalya** MD (Psychiatry), Senior Resident , Department of Psychiatry,  
Sri Venkateswara Medical College & Hospital & Research Centre.  
Puducherry – India.

### **2nd Author & corresponding author**

**Dr. Mathivanan** MD (Psychiatry), Assistant professor, Department of Psychiatry  
Government Omandurar Medical College  
Chennai 600002, Tamil Nadu – India  
9442552002, [dr.mathivanan@gmail.com](mailto:dr.mathivanan@gmail.com)

### **3rd author**

**Dr KN Lavanya** MD (Psychiatry), Assistant professor , Department of Psychiatry  
Madras Medical College  
Chennai 600 003, Tamil Nadu – India

### **Abstract**

#### **Introduction**

Various Studies have shown that the early- and late-onset schizophrenia patients differ and accompanied by impairments in several domains of cognitive function. Hence studying Cognitive impairment will be helpful to understand pathology and phenomenology of schizophrenia and giving cognitive remediation therapy in a better way.

#### **Aims**

To evaluate the neurocognitive impairment in Early-onset Schizophrenia and Late-onset Schizophrenia. To find out difference in severity of neurocognitive impairment between two groups.

#### **Materials and methods**

This study was approved by Institutional Ethical Committee, Madras Medical College, Tamil Nadu, India. The study subjects were taken from the Institute of mental health hospital. For each group, 150 samples were taken. Administration of NIMHANS neuropsychological battery to both groups testing domains of, Working memory, Verbal learning & memory, Auditory verbal learning test, Visual learning & memory and Mental speed. The results were statistically evaluated with IBM SPSS 20.

#### **Results**

Verbal N Back test hits were comparatively higher in late onset schizophrenia patients than early onset. Similarly the error was more in early onset schizophrenia patients. Visual N Back test hits were comparatively higher in late onset schizophrenia patients than early onset. Similarly the error was more in early onset schizophrenia patients. The time taken was similar in both the groups. The error due to digital vigilance test was more in early onset schizophrenia patients. The time taken for color trail test was significantly higher in early onset schizophrenia patients. The time taken for complex figure test was significantly higher

in late onset schizophrenia patients. The time taken for Digital symbol substitution test was significantly higher in early onset schizophrenia patients.

### **Conclusions**

In this study, early onset schizophrenia patients had more cognitive impairment than late onset schizophrenia patients in most of the measured cognitive domains.

**Keywords** – neuro cognitive impairment, early onset, late onset, schizophrenia

### **Introduction**

Schizophrenia is a complex psychiatric disorder characterized by disabling alterations in perception, cognition, and behaviour (1). With the onset of disease, Schizophrenia is classified as early onset Schizophrenia (Onset Between 13-18years) and Late onset schizophrenia (onset after 40 years) (2,3). Various Studies have shown that the early- and late-onset patients differ across many different aspects. It is accompanied by impairments in several domains of cognitive function. Mental processes like attention, memory, processing speed and learning, verbal fluency, executive functions and working memory are the higher order intellectual activities referred to as cognitive functions. Neurocognition involves cognitive functioning and associated structures and processes of the central nervous system. Reduction in the cognitive functioning in one of these areas following a mental or neurological illness is called neurocognitive deficit (4). In clinical diagnosis and research, various neurocognitive test batteries have been developed across the world which are standardized and administered easily. Cognitive dysfunctions are the core disturbances in Schizophrenia & severity is predictive of the course of the disease. A common theme in cognitive changes observed after psychosis onset is that they seem to reflect both decline from baseline functioning and failure to show the age-related gains observed in healthy developing youth (5,6).

A recent meta-analysis, comparing cognitive functioning between the Early onset & late onset, found that early-onset patients exhibited larger deficits in arithmetic, executive function, IQ, psychomotor processing speed and verbal memory (7). Some studies suggested that early-onset patients generally had poorer outcomes than late-onset patients (8). While some found no differences in symptoms and functioning or even fewer symptoms and superior functioning at long-term follow up. Though studies are carried upon this, results are far from being conclusive. Hence studying Cognitive impairment in link with onset of schizophrenia acquires need and relevance so as to understand pathology and phenomenology of schizophrenia in a better way. Knowing the severity of cognitive deficit based on age at onset of illness would be the predictor of long term course of illness, therapeutic application of Cognitive remediation therapy, even prophylactically at the right time.

### **Materials and methods**

This study was approved by Institutional Ethical Committee, Madras Medical College, Tamil Nadu, India. The study subjects were taken from the Institute of mental health hospital. For each group, 150 samples were taken.

#### **Inclusion criteria:**

Individuals diagnosed as Schizophrenia as per ICD-10 criteria.

Group1- Onset of illness 13-18years of age

Group2-Onset of illness 40-60years of age

**Exclusion criteria:**

Individuals with BPRS score above 30, so as to not understand the study or provide valid consent at the time of evaluation. Other Neurological conditions. Seizure disorders. H/o Head injury with loss of consciousness. Other psychiatric conditions. Substance dependence & induced Psychiatric disorder. Comorbid physical illness.

Socio demographic details were collected by a semi structured questionnaire. Administration of NIMHANS neuropsychological battery to both groups testing domains of,

Working memory - Verbal N-Back test , Visual N-back test,

Attention- Sustained Attention-Digit Vigilance test , Focused Attention-Colour Trail test,

Verbal learning & memory- Auditory verbal learning test,

Visual learning & memory - Complex figure tests,

Mental speed - Digit symbol substitution test.

The results of the cognition tests of two groups were compared statistically. Descriptive statistics were reported as mean (SD) for continuous variables, frequencies (percentage) for categorical variables. Chi-Square at 5% level of significance was used to find statistical significance. Fischer's exact test is when expected cell count is less than 5. Independent T test was used to find the significant difference between the two groups. Data were statistically evaluated with IBM SPSS 20.

**Results**

Table 1

Distribution of age among the study participants (N=300)

S.no	Age	Group A	Group B	X <sup>2</sup> , (df), p
1	26-30	27 (18)		14.95 (4) 0.005
2	31-35	29 (19.3)		
3	36-40	29 (19.3)	62 (41.3)	
4	41-45	34 (22.7)	51 (34.0)	
5	46-50	31 (20.7)	37 (24.7)	

Table 2

Distribution of verbal N back test among the study participants (N=300)

S.No	Variable	Group A	Group B	P value
1	Verbal N Back test hits	3.06±1.43	6.99±1.43	<0.001
2	Verbal N Back test Error	7.18±1.42	2.49±1.72	<0.001

Table 3

Distribution of visual N back test among the study participants (N=300)

S.No	Variable	Group A	Group B	P value
1	Visual N Back test hits	2.96±1.48	6.78±1.41	<0.001
2	Visual N Back test Error	7.29±1.43	2.31±1.78	<0.001

Table 4

Distribution of digital vigilance test among the study participants (N=300)

S.No	Variable	Group A	Group B	P value
1	Digital vigilance test TT (sec)	655.28±233.14	655.09±170.34	0.78
2	Digital vigilance test error	52.82±28.80	17.50±10.70	<0.001

Table 5

Distribution of Color trail test among the study participants (N=300)

S.No	Variable	Group A	Group B	P value
1	Color trail test (sec)	98.94±44.94	86.50±30.43	<0.001

Table 6

Distribution of complex figure test among the study participants (N=300)

S.No	Variable	Group A	Group B	P value
1	complex figure test (min)	12.95±1.32	17.40±1.13	<0.001

Table 7

Distribution of digital symbol substitution test among the study participants (N=300)

S.No	Variable	Group A	Group B	P value
1	digital symbol substitution test (sec)	403.95±145.17	389.53±136.22	0.34

Table 8

Tests comparison among various studies

S. No	Tests	Eissa et al		Francisca et al		Present study	
		Early onset	Late onset	Early onset	Late onset	Early onset	Late onset
1	BPRS	-	-	-	-	16.42±8.81	13.85±9.54
2	Verbal N Back test hits	8.9 ± 4.04	7.52 ± 3.54	10.69 ± 4.39	11.08 ± 3.36	3.06±1.43	6.99±1.43
3	Visual N Back test hits	4.46 ± 2.0	3.46 ± 2.69	4.88 ± 2.36	5.07 ± 1.78	2.96±1.48	6.78±1.41
4	Digital vigilance test TT (sec)	5.54 ± 3.75	4.12 ± 2.55	616 ± 232	633 ± 283	655.28±233	655.09±170
5	Color trail test (sec)	-	-	100 ± 73	96 ± 65	98.94±44.94	86.50±30.4
6	Complex figure test (min)	6.9 ± 2.56	6.06 ± 1.40	11.47 ± 0.98	11.90 ± 0.46	12.95±1.32	17.40±1.13
7	Digital symbol substitution test (sec)	7.12 ± 4.07	5.4 ± 12.00	544 ± 329	506 ± 250	403.95±145	389.53±136

The mean age of the participants in group A was 28.47±7.03 years and in group B was 40.71±6.01 years (Table 1). The mean age of onset of illness of the participants was significantly lower in group A (15.41±1.67 years) compared to group B which was about 40.95±6.64 years. Verbal N Back test hits were comparatively higher in late onset schizophrenia patients than early onset. Similarly the error was more in early onset schizophrenia patients (Table 2). Visual N Back test hits were comparatively higher in late onset schizophrenia patients than early onset. Similarly the error was more in early onset schizophrenia patients (Table 3). The time taken was similar in both the groups. The error

due to digital vigilance test was more in early onset schizophrenia patients (Table 4). The time taken for color trail test was significantly higher in early onset schizophrenia patients (Table 5). The time taken for complex figure test was significantly higher in late onset schizophrenia patients (Table 6). The time taken for Digital symbol substitution test was significantly higher in early onset schizophrenia patients (Table 7).

### **Discussion**

In this study majority were in the age group of 41-45 years in late onset schizophrenia and majority in 31-40 years in early onset schizophrenia. The age wise distribution among the groups was comparable as well across various studies (9,10). The mean age of onset of illness of the participants was significantly lower in early onset schizophrenia ( $15.41 \pm 1.67$  years) compared to late onset schizophrenia which was about  $40.95 \pm 6.64$  years. These results were comparable across various studies. (9,10,11). The idea of the cognitive deficits that might be related with age at onset has changed in different studies, as some found no distinction in types of cognitive deficits between early onset schizophrenia and late onset schizophrenia patients. Few authors found that late onset schizophrenia related with milder deficits, especially in the areas of learning, abstraction, and cognitive flexibility (12,13). Albeit most examinations have proposed a higher-than-ordinary pace of cognitive decline, some clinical studies reported that psychosis emerging late in life is related with a more noteworthy number of psychological dysfunctions. Finally, psychosis late in life may be associated with more cognitive decline, which is in agreement with the findings of Ostling et al. (14). In this study, the interaction between duration of illness, aging process, and sensory deficit may lead to more and different cognitive impairments in the early onset schizophrenia patients

### **Conclusion**

In this study, early onset schizophrenia patients had more cognitive impairment than late onset schizophrenia patients in most of the measured cognitive domains.

### **Limitation**

Comparing both groups with different durations of illness may act as a potential confounder, as results in the late onset schizophrenia gathering might be influenced by the long term of disease. Similarly gender, education, locality comparison were also not done which may have interference in determining cognitive functioning (15). At last, there was no medication control in this study, which may affect the results as well.

**Conflicts of interest - Nil.**

**Funding - Nil.**

### **References**

1. American Psychiatric Association: Schizophrenia. Diagnostic and Statistical Manual of Mental Disorders. 5th ed. Arlington, VA: American Psychiatric Association; 2013:99-105.
2. Robert Howard, Peter V. Rabins, Mary V. Seeman, Dilip V. Jeste. Late onset Schizophrenia and Very late onset Schizophrenia like psychosis: An International consensus. American journal of Psychiatry 2000; 157:2, 172-178
3. Köhler S., van Os J., de Graaf R., et. al.: Psychosis risk as a function of age at onset: a comparison between early- and lateonset psychosis in a general population sample. Soc Psychiatry Psychiatr Epidemiol 2007; 42: 288-294

4. Fagerlund B., Pagsberg A.K., Hemmingsen R.P.: Cognitive deficits and levels of IQ in adolescent onset schizophrenia and other psychotic disorders. *Schizophr Res* 2006; 8: 30-39
5. Kravariti E., Morris R.G., Rabe-Hesketh S., et. al.: The Maudsley Early-Onset Schizophrenia Study: cognitive function in adolescent-onset schizophrenia. *Schizophr Res* 2003; 61: 137-148.
6. Holmén A., Juuhl-Langseth M., Thormodsen R., et. al.: Neuropsychological profile in early-onset schizophrenia-spectrum disorders: measured with the MATRICS battery. *Schizophr Bull* 2010; 36: 852-859.
7. Rajji, T., Ismail, Z., & Mulsant, B. (2009). Age at onset and cognition in schizophrenia: Meta-analysis. *British Journal of Psychiatry*, 195(4), 286-293. doi:10.1192/bjp.bp.108.060723
8. Schmidt, M., Blanz, B., Dippe, A. et al. Course of patients diagnosed as having schizophrenia during first episode occurring under age 18 years. *Eur Arch Psychiatry Clin Neurosci* 245, 93–100 (1995). <https://doi.org/10.1007/BF02190735>
9. Hui CL, Li AW, Leung CM, Chang WC, Chan SK, Lee EH, Chen EY. Comparing illness presentation, treatment and functioning between patients with adolescent-and adult-onset psychosis. *Psychiatry research*. 2014 Dec 30;220(3):797-802.
10. Francisca Sá, Pinto P, Cunha C, Lemos R, Letra L, Simões M, Santana I. Differences between Early and Late-Onset Alzheimer's Disease in Neuropsychological Tests. *Front Neurol*. 2012 May 14;3:81. doi: 10.3389/fneur.2012.00081. PMID: 22593755; PMCID: PMC3350945.
11. Yasuda M, Kobayashi T, Kato S, Kishi K. Clinical features of late onset schizophrenia in Japan: comparison with early-onset cases. *Psychogeriatrics*. 2013 Dec;13(4):244-9. doi:10.1111/psyg.12032. PMID: 24289465
12. Eissa AM, Hassan GA, Hwedi D, Khalil AH. Cognitive profile in late-onset schizophrenia: A comparative study with early-onset schizophrenia. *Middle East Current Psychiatry*. 2013 Jan 1;20(1): 6-13.
13. Howard R, Rabins PV, Seeman MV, Jeste DV. Late-onset schizophrenia and very-late-onset schizophrenia-like psychosis: an international consensus. *Am J Psychiatry* 2000; 157:172–178. 88
14. Ostling S, Johansson B, Skoog I. Cognitive test performance in relation to psychotic symptoms and paranoid ideation in nondemented 85-year-olds. *Psychol Med* 2004; 34:443–450.
15. Häfner H, Hambrecht M, Löffler W, Munk-Jørgensen P, Riecher-Rössler A. Is schizophrenia a disorder of all ages? A comparison of first episodes and early course across the life-cycle. *Psychol Med* 1998; 28:351–365.