

ORIGINAL RESEARCH

To study the clinical correlation of verbal learning and memory in patients with seizure disorders

¹Savita Patel, ²Abhay Paliwal¹M.D. Psychiatry, ²Associate Professor, Department of Psychiatry, M.G.M. Medical College, Indore, Madhya Pradesh, India**Corresponding author**

Abhay Paliwal

Associate Professor, Department of Psychiatry, M.G.M. Medical College, Indore, Madhya Pradesh, India

Email: 27071990july@gmail.com

Received: 21 April, 2023

Accepted: 23 May, 2023

ABSTRACT

Aim: To study the clinical correlation of verbal learning and memory in subjects with seizure disorders. **Methods:** The study was conducted in a tertiary care hospital over a period of 1yr after taking informed consent from 100 patients by random sampling after fulfilling the inclusion criteria. **Results:** In our study, we found that seizure frequency >10 episodes/years was positively associated but not statistically significant with verbal learning and memory{AVLT(NC)-39%, AVLT(IR)-27%, AVLT(DR)-32%}. **Conclusions:** High educational level, well controlled seizure and healthy psychological state are protective factors for cognitive function of epileptic patients.

Keywords: Cognitive impairment, Cognition, Seizures, verbal learning and memory.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

INTRODUCTION

Cognition includes the brain's response to the objective world, having range from simple perception of the people themselves and the environment, attention, judgment, to the ability of performing complex mathematical calculation, language ability, memory, space ideation, executive function, etc.[1]

Memory deficits are subjectively seen often in the epileptic clinic [2]. Performance of Epileptic patients was poorer on the Boston memory scale as compared to normal [3]. Initial registration, of numbers and geometric figures was poorer, when it was compared with learning in patients, whose epilepsy was well controlled, indicating that short term memory was more compromised than learning [2]. Immediate and delayed memory for verbal and visual material was impaired, which was mostly due to poor recall, in patients with well controlled epilepsy [4]. Long term storage and retrieval from long term memory was impaired for verbal and visual material. Deficits of short-term storage were also present and obvious. Information encoding could be slowed down, as patients require a greater number of presentations to learn [5]. Frequent and longer presentations of the material improve the memory scores [6].

MATERIAL AND METHODS**STUDY SETTING**

This is a hospital based cross-sectional study, which was conducted in outpatient department of psychiatry, MGM Medical College and mental hospital Banganga, after clearance obtained institutional ethic committee of MGMMC, Indore. Patients were included after the meeting inclusion criteria and those patients who do not meet inclusion criteria are excluded from the study.

STUDY DESIGN

The study was carried out with a cross sectional observational study the as per the designed objective of the study.

SAMPLE

Purposive sampling technique was used. The study sample was consisted of 100 subjects of seizure.

INCLUSION AND EXCLUSION CRITERIA

- The patients included were in the age group of 18 to 60 years of either sex and diagnosed as having epilepsy as per ILAE Classification. Patients with mental retardation, head injury, substance dependent. Any medical co morbidity, Pregnancy

and lactation were excluded.

- Written informed consent was obtained from all participants after complete description of the study to the subjects.

ETHICAL CONSIDERATION

The study was approved by Institutional Ethics Committee. Written informed consent was taken from the study subjects. They were informed about the purpose of the study and were ensured confidentiality. They were also informed about their right to withdraw any point of time during the study and told that their withdrawal from study would not have any impact in the treatment of the condition. All voluntary participants were informed of possible risks and benefits of participating in the research.

SOCIO DEMOGRAPHIC AND CLINICAL FACTORS

The sociodemographic details of the patients and clinical factors like seizure type, seizure frequency, and duration of seizure, duration to antiepileptic drugs were taken.

TEST FOR VERBAL LEARNING AND MEMORY-

Rey's Auditory Verbal Learning Test (AVLT)

It consists of words designating familiar objects like vehicles, tools, animals and body parts. There are two lists of words A and B, with 15 different words in each list. The words were translated into the four Indian languages of Kannada, Tamil, Telugu and Hindi. The words in Indian languages are given in English script.

Procedure:- Words in List A are presented at the rate of one word per second during 5 successive trials. The words are presented in the same order in every trial. Each trial consists of the presentation of all 15 words, immediately followed by recall of the same. In each trial, after the presentation the subject is asked to recall the words but no cues are given. The examiner

notes down the responses verbatim in the order in which the subject gives them. On an average, recall in each trial takes approx. 2 minutes. After the completion of all the five trials of List A, words in List B are presented once and an immediate recall is taken for the same. The presentation of List B serves as an interference and prevents the subject from recalling the words from List A subsequently from immediate memory. This is followed by the immediate recall of words from List A. After a delay of 20 minutes, words from List A are again recalled to form the delayed recall score. List A is not read out again for immediate and delayed recall. Following delayed recall, recognition of the words in List A is tested. The words in List A are randomly mixed with 15 new words. The new words are either phonemically or semantically similar to words in List A. The words are called out one at a time and the subject indicates whether each word belonged to List A or not. Hits and errors are recorded. The words are presented in the mother tongue of the subject or in English whichever the subject prefers.

Score:- The number of words correctly recalled in each of the 5 trials of List A as well as the total number of words recalled over all the five trials forms the learning score. The number of words recalled correctly in the immediate recall trial, delayed recall trial and the recognition trial form the memory score. In the recognition trial the Hits are scored separately. Omissions and Commissions form the errors. The other scores are the Long-Term Percent Retention which is calculated by the formula: Delayed recall score/Trial 5 x 100.

Duration:- The test takes about 30 minutes.

STATISTICAL ANALYSIS

The statistical analysis of data was done by SPSS version 23.0 (SPSS South Asia Pvt Ltd., Bengaluru, Karnataka, India). Test of significance was seen by chi square test and fisher exact test was applied for correction wherever applicable.

RESULTS

Table 1: Association of clinical variables with cognitive domain –Auditory verbal learning test(AVLT)

Variables	<15 Percentiles			>15 Percentiles			P Value		
	NC	IR	DR	NC	IR	DR	NC	IR	DR
AVLT									
Type of seizure							0.67	0.81	0.19
CPS	2	2	2	4	4	4			
CPSwith generalization	2	3	3	5	4	4			
GTCS	21	44	56	66	43	31			
Seizure frequency							0.08	0.12	0.17
<10 episodes/years	36	22	29	17	31	24			
>10 episodes/years	39	27	32	8	20	15			
Duration of seizure							0.06	0.07	0.45
0-2 years	10	5	8	6	11	8			
3-5 years	18	11	16	10	17	12			
>5 years	47	33	37	9	23	19			
Duration of AED							0.07	0.19	0.82
Drug naive	28	21	24	10	17	14			
0-1years	4	3	5	6	7	5			

1-2years	9	3	7	3	9	5			
2-5years	12	7	8	3	8	7			
>5years	22	15	17	3	10	8			
Medication status							0.81	0.61	0.63
Drug Naïve	28	21	24	10	17	14			
Monotherapy	24	15	18	9	18	15			
Polytherapy	23	13	19	6	37	10			

DISCUSSION

In the present study, generalized tonic clonic seizure shows cognitive decline in verbal learning and memory AVLT[Total number corrected 21%, Immediate recall 44% ,delayed recall 56%]in this study generalized seizure was compared with partial seizure, was strongly correlated with the cognitive performance of epileptic patients it might be because of epileptic discharge of the generalized seizure exist in the bilateral cerebral hemisphere,causing greater control difficulty and exerting a more effect on the cognitive function and in our study, there is no statistically significant association exist between verbal learning and memory with seizure type this may be because of 87% cases had generalized seizure and different results related to different patients with different seizure type so the results might be secondary to an overlap effect, or different seizure types may operate through the same mechanism or pathways that lead to inconsistent results(Wang et al,2019) [7]

.In our study, we found that seizure frequency >10 episodes/years was positively associated but not statistically significant with verbal learning and memory {AVLT(NC)-39%, AVLT(IR)-27%, AVLT(DR)-32%}, because seizure causes neuronal damage and excessive synchronous discharge from brain neurons causes epileptic seizure. As a result of it, hypoxia in the neuronal membrane and electricity failure cause irreversible damage to neurons and frequent seizures increases the time of abnormal discharge in the grey matter which affect the brain function and resulting in an impairment in the cognitive function. Another study found that the long-term or repeated seizures can worsen cognitive impairment [8].

Over the disease process, seizure duration had greater impact on cognitive performance of the epileptic patients. Previous studies indicate that specific cognitive impairment, such as decline in memory, attention, executive function, naming ability, and verbal fluency deteriorates with the extending disease duration(Taylor & Baker [9], 2010).The reason behind that is longer disease duration may causes neuronal damage and produce a cumulative effect, which might lead to abnormal cerebral morphological, structural and metabolism which gradually aggravate the cognitive impairment.

Cognitive function in epileptic patients can be also compromised by the AEDs taken. Previous studies have reported that epileptic patients have impairment in verbal memory, visual memory and visuo spatial

ability as a result of taking more kinds of AEDs [10] and that the kinds of drugs taken can serve as a predictor of the impairment in domains of memory, attention, and executive function [11].

CONCLUSION

Seizure related factors like Seizure frequency and duration of seizure are statistically significantly associated with cognitive function and have negative impact on verbal learning and memory .High educational level, well controlled seizure and healthy psychological state are protective factors for cognitive function of epileptic patients.

FINANCIAL SUPPORT AND SPONSORSHIP

Nil.

CONFLICTS OF INTEREST

There are no conflicts of interest

REFERENCES

1. Martin, M., Clare, L., Altgassen, A. M., Cameron, M. H., & Zehnder, F.(2011). Cognition-based interventions for healthy older people and people with mild cognitive impairment. *The Cochrane Database of Systematic Reviews*, CD006220.
2. Gilliam, F., & Kanner, A. M. (2002). Treatment of depressive disorders in epilepsy patients. *Epilepsy and Behavior*, 3 (Suppl. 5), S2-S9
3. Smith D B, Craft R B, Collins J, Mattson R H, Cramer J A, V. A. Cooperative study group. Behavioural characteristics of epilepsy patients compared with normal controls *Epilepsia* Page: 27: 753-759, 1986
4. Loiseau P, Strube E, Broustet D, Batelochi S, Gomeni C & Morselli P L, Learning impairment in epileptic patients
5. Mohan V, Varma V K & Sawhney B B, Intellectual and memory functions in epileptics *Neurology India* Page: 24: 110, 1976
6. Loiseau P, Strube L & Signoret J L, Memory and epilepsy In: Trimble M R & Reynolds E H (Eds.). *Epilepsy, Behaviour and Cognitive Function*. New York: John Wiley & Page: 165-176, 1988
7. Wang L, Chen S, Liu C, Lin W, Huang H. Factors for cognitive impairment in adult epileptic patients. *Brain Behav*. 2019;00:e01475
8. Piazzini, A., Canevini, M. P., Turner, K., Chifari, R., & Canger, R. (2006). Elderly people and epilepsy: Cognitive function. *Epilepsia*, 47(Suppl5), 82-84
9. Taylor, J., & Baker, G. A. (2010). Newly diagnosed epilepsy: Cognitive outcome at 5 years. *Epilepsy & Behavior*, 18, 397-403.
10. Piazzini, A., Turner, K., Chifari, R., Morabito, A., Canger, R., & Canevini, M. P. (2006). Attention and psychomotor speed decline in patients with temporal lobe epilepsy: A longitudinal study. *Epilepsy*

- Research*, 72, 89–96
11. Berg AT. Epilepsy, cognition, and behavior: The clinical picture. *Epilepsia*. 2011; 52: 7-12. <https://bit.ly/2MTBYVW>