Research Article

Neuropsychological Characteristics for Admitted Patients with Left Temporal Lobe Epilepsy Disorder in Saudi Arabia: Cross-sectional Study

Althunayan A* and Al-Arjan S

Department of Clinical Psychology, King Saud bin Abdulaziz University for Health Science, Saudi Arabia

*Corresponding author: Abdullah Althunayan, Master of Clinical Psychology, King Saud bin Abdulaziz University for Health Science, Riyadh, Saudi Arabia

Abstract

Background: Chronic temporal lobe epilepsy has an impact on the focal sensory systems. Because the seizures remain for a specific period of time or are extended and referred to as complex seizures that spread to different regions of the brain, the condition is referred to as a typical type of epilepsy with central seizures.

Objective: The cross-sectional study aimed to determine the neuropsychological characteristics of adult patients with left temporal lobe epilepsy, who could be admitted to an epilepsy monitoring facility for EEG testing.

Patients and Methods: In 2022 (during a brief period of time between 2019 and 2020), a cross-sectional review of 27 adult patients with left temporal lobe epilepsy was conducted to assess the cognitive function by using the Wechsler Adult Intelligence Scale (WAIS) in patients admitted to King Abdul-Aziz Medical City (National Guard). The data was made public by the mental health department in the King Abdul-Aziz Medical city.

Results: A total of 27 right-handed Saudi patients (19 males and 8 females) over the age of 20 years, all of whom had left temporal lobe epilepsy disorder, were studied. The results of the study showed that there were no statistically significant differences between men and women in general. Except for processing speed, the female showed better than the male. This study provides a strong indicator that Saudi adult patients undergoing EEG examinations for the epilepsy monitoring unit should be admitted.

Conclusion: Patients with left temporal lobe epilepsy disorder demonstrate interactions in some mental processes that have an effect on how well they perform on evaluations of intelligence such as (WAIS). The findings of this study demonstrate the requirement for further neuropsychological assessments in order to enhance the medical services offered to these patients.

Keywords: Neuropsychological characteristics; Left temporal lobe epilepsy disorder; Epilepsy; Right-handed; Saudi arabia; Cross-sectional study

Abbreviations

TLE: Temporal Lobe Epilepsy; Left TLE: Left Temporal Lobe Epilepsy; EMU: Epilepsy Monitor Unite; WAIS: Wechsler Adult Intelligence Scale; WAIS-IV: Wechsler Adult Intelligence Scale, Fourth Edition; IQ: Intelligence Quotient; VCI: Verbal Comprehension Index; POI: Perceptual organization Index; WMI: Working Memory Index; PSI: Processing Speed Index

Introduction

Epilepsy is a classic neurological problem described as intermittent synaptic seizures that cause epilepsy. For instance, in Saudi Arabia, the incidence of epilepsy is estimated at 6.54 cases per 1,000 people [1], and this type of epilepsy has recently been classified as "temporal lobe epilepsy". Epilepsy in the left Temporal Lobe Epilepsy (left TLE) can be at any age with early starting on birth or late after ten years of onset [2], and it is linked to a variety of medications, most of which

are well-controlled. However, the investigations on patients with left TLE have been trustworthy and well-collected to far [3].

Temporal lobe epilepsy is a chronic illness that affects the focal sensory systems. This condition manifests itself in the form of single unprovoked central seizures that recur in the temporal lobe [4]. These seizures last for a certain period of time, so the condition is described as a normal type of epilepsy with central seizures. Temporal lobe epilepsy Patients have often incomplete seizures that affect the temporal lobe only. While this is probably not the case, affected individuals will experience complex seizures that spread to different parts of the affected patient's brain [5].

It was coined in 2005 by the International League Against Epilepsy and the International Agency for Epilepsy as a psychiatric problem with a predisposition to seizures and neuropsychological social consequences, and it represents a more reasonable assessment of epilepsy's clinical impact [6]. Epilepsy is described by: (a) two

unprovoked (or reversible) seizures within 24 hours of each other; (b) special (or reflex) emergencies in the next 10 years with the probability of new emergencies (about 60%); or (c) identifying epilepsy, described as a long-term likelihood of recurrent seizures that may present in more than one way, depending on the psychology affected and the age of the individual. Treatment for epilepsy is usually medication-based and is completely controlled in about 70-80% of patients [7].

Thus, these data confirm the need for further study of the neuropsychological features of left-sided temporal lobe epilepsy. This study was designed to pooled preliminary information on neuropsychological outcome in patients with Left TLE.

Furthermore, the Wechsler Intelligence Scale was needed to determine the neuropsychological characteristics of these patients, this scale originally developed at Bellevue Hospital, a psychiatric hospital in New York City. For a long time, the Wechsler scale has been widely utilized in psychological clinics and therapeutic facilities as a thorough psychological diagnostic instrument and a test for decision-making and treatment planning. Arabic version of the Wechsler Adult Intelligence Scale, fourth edition. The Wechsler Adult Intelligence Scale-IV (WAIS-IV) is a administered clinical tool for individual to assess the intellectual abilities in people aged 16 and older, It is the latest in a long line of IQ tests that have been developed, tested, and improved [8]. The WAIS-IV Extended Prediction Scale's historical background, changes in skills and resources, and the location in which they are located are all examined here.

Despite this, when compared to neuropsychological complications, assessing the cognitive function of adult patients with left temporal lobe epilepsy has received minimal attention. The present study aims to appropriately assess the neuropsychological characteristics of adult patients with left temporal lobe epilepsy who may be admitted to an epilepsy monitoring facility for EEG testing, considering the lack of cross-sectional studies focused on this issue in Saudi Arabia (SA).

Methods

Criteria for including studies in the review

Type of disorder: Cognitive impairment is a common complication of epilepsy that has a detrimental effect on several facets of daily situations. Patients with Temporal Lobe Epilepsy (TLE) frequently exhibit cognitive impairment, which affects not just memory but also language, attention, and higher-level problem-solving skills [9-11]. Even in early stages, lesional etiology is associated with more profound cognitive dysfunction than non-lesional cases, and persistent TLE, especially if untreated, has been associated with cognitive decline [12-14]. Language functions are specialized on Left Temporal Lobe Epilepsy Disorder, and there is significant evidence that left seizure foci and left hippocampal sclerosis are associated with verbal memory loss.

Types of participants: There were 27 participants in the study that were right-handed (20 years old and over). Epilepsy in the Left Temporal Lobe had been diagnosed in the participants (LEFT-TLE). This research fulfills the inclusion requirements for Inclusion criteria [15,16], which include chronological age, no history of mental or substance addiction, and no significant cognitive impairments.

Types of measures: Studies were qualified for inclusion

1) Used standardized physical and Psychometric examinations, which involves many variables, including the medical history, developmental history, Behavioral history, family history, and physical examination. In order to evaluate the symptoms of diagnoses, intellectual abilities, severe impairment to superior abilities, and psychometric assessment.

2) The Wechsler Adult Intelligence Scale (WAIS) was used in order to recognize and evaluate intellectual abilities, which is one of the most widely used tests for evaluating cognitive ability in adults. Moreover, the researcher used the Saudi Arabian version of the WAIS, fourth edition, it consists of 11 core subtests that result in four component index scores (Verbal Comprehension, Perceptual organization, Working Memory, and Processing Speed), and an overall Intelligence Quotient (IQ).

Types of studies: This is cross-sectional study of Saudi adult patients with left temporal lobe epilepsy, focused to assess the cognitive function in patients admitted to King Abdul-Aziz Medical City (National Guard) published by the King Abdul-Aziz Medical City's adult mental health department in Riyadh, Saudi Arabia (National Guard) from 2000 until 2022, was searched using the following keywords: Neuropsychological Characteristics, Left Temporal Lobe Epilepsy disorder, Epilepsy, Right-handed, Saudi Arabia, Cross-sectional study.

Results

Patients or individuals administered the WAIS-IV in order to examine their current level of functioning which consists of abstract reasoning, representation, problem solving, and decision making. The WAIS-IV groups an individual's ability into four global areas: a- Verbal Comprehension Index (VCI), which measures verbal ability; b- Perceptual Organization Index (POI), which involves the manipulation of concrete materials or processing of visual stimuli to solve problems nonverbally; c- Working Memory Index (WMI), which measures short-term memory; and d- Processing Speed Index (PSI), which measures cognitive processing efficiency.

The VCI, measuring the Crystallized Intelligence (Gc), represents patient or individual ability to reason with previously learned information. One's Gc ability develops largely as a function of both formal and informal educational opportunities and experiences. Gc is assessed by tasks that require defining words (Vocabulary), draw conceptual similarities between words (Similarities), and answer questions regarding a broad range of general knowledge topics (Information).

The PRI, a measure of Visual Processing and Fluid Reasoning (Gv/Gf), represents patient or individual ability to analyze and synthesize visual stimuli as well as to reason with it. To assessed Gv or Gf tasks ability that require to recreate a series of pictured designs or modeled using Block Design, identify the missing portion of an incomplete visual matrix from one of five response options (Matrix Reasoning), and reconstruct a puzzle from a given visual (Visual Puzzles).

The WMI, a measure of Short-Term Memory (Gsm), represents the ability to apprehend and hold, or transform, information in immediate awareness and then use it within a few seconds. Patient

Table 1: General characteristics of selected patients.

No.	Gender	Hand Dominance	Verbal comprehension	Perceptual organization	Working memory	Processing speed	Overall IQ
1	Female	Right-handed	47	47	30	29	153
2	Male	Right-handed	27	21	7	12	67
3	Male	Right-handed	57	25	17	4	103
4	Male	Right-handed	22	25	24	19	90
5	Male	Right-handed	37	40	22	23	122
6	Male	Right-handed	22	20	12	14	68
7	Male	Right-handed	47	39	25	21	122
8	Male	Right-handed	33	33	22	9	97
9	Male	Right-handed	20	25	15	10	70
10	Female	Right-handed	13	24	17	7	61
11	Male	Right-handed	24	27	9	10	70
12	Female	Right-handed	17	26	5	5	53
13	Female	Right-handed	34	30	21	23	108
14	Male	Right-handed	37	18	17	13	85
15	Male	Right-handed	23	33	22	5	83
16	Male	Right-handed	34	14	12	6	66
17	Male	Right-handed	13	32	7	9	61
18	Female	Right-handed	14	33	15	19	81
19	Male	Right-handed	46	36	17	17	116
20	Male	Right-handed	27	29	13	3	72
21	Male	Right-handed	26	23	11	13	73
22	Male	Right-handed	19	21	6	9	55
23	Male	Right-handed	33	24	26	25	108
24	Male	Right-handed	16	28	14	12	70
25	Female	Right-handed	52	36	24	15	127
26	Female	Right-handed	9	17	7	21	54
27	Female	Right-handed	36	34	24	23	117
Total = 27	19 M – 8 F						

Table 2: The mean plus/minus SD and 95th percentile reference values by gender parameters for WAIS four components.

Gender parameters	Verbal comprehension	Perceptual organization	Working memory	Processing speed	Overall IQ
%Male (n=19)*	29.63±11.44	27±7.08	15.68±6.39	12.31±6.29	84.10±21.27
%Female (n=8)*	27.75±16.64	30.87±8.98	17.87±8.65	17.75±8.27	94.25±37.48
Total %Male & %Female (n=27)*	29.07±12.88	28.14±7.72	16.33±7.03	13.92±7.23	87.11±26.71
*The number of patients					

or individual Gsm ability was assessed by two tasks; Digit Span, which require to repeat a sequence of numbers in the same order as presented by the examiner (Digit Span Forward) and also in the reverse order (Digit Span Backward) and in sequential order (Digit Span Sequencing). Also required within a specified time limit (Arithmetic to mentally solve arithmetic problems.

The PSI, a measure of Processing Speed (Gs), represents the ability to perform simple, clerical-type tasks quickly. Gs ability was assessed patient or individual with two tasks; one required to quickly copy symbols that were paired with numbers according to a key (Coding),

and the other required to identify the presence or absence of a target symbol in a row of symbols (Symbol Search).

By splitting grades is to view the WAIS aggregated grades for the broader subjects. According to Alzahrani, 2009 diagnostic classification of IQs the cumulative score is an IQ with an average score of 90-99,100-109. Any value between 90 and 109 is considered average. Scores of 110 to 119 are considered high average, scores of 120 to 129 are considered excellent, and scores of 130 and above are considered very well. At the other end of the spectrum, 80 to 89 is considered a low average, 70 to 79 is low, and 69 and below is very

low. The next section is the percentile order.

The highest possible score here is 99.9%. The median percentage is half, so the 50th percentile is an IQ of 90-99. Moreover, the score indicates how well the patients did on the test compared to other peers by extracting the Mean for each four component index scores between male and female and the total IQ (mean score ± Standard deviation). This measurement shows that 95% of the results will be within the specified range as the test progresses. Five percent of the results may fall outside the specified range. In the end, the accuracy of the results is around 95%, which is great for performance and intelligence tests.

Study findings

The result shows that 19 male and 8 female patients out of a total of 27 participants diagnosed with Left temporal lobe epilepsy during the study period. The Table 1 shows the General Characteristics of Selected Patients and by calculation the mean plus/minus SD and 95th percentile reference values by gender parameters for WAIS four components as it been shown in Table 2.

The mean ± (SD) of overall IQ score in the male group was 84.10 ± (21.27), which is considered below average. Whereas the female received an average score of 94.25 ± (37.48) overall IQ. The difference in overall IQ score between the male and female groups was 87.11 % (95% CL) (76.54% - 97.68%).

To illustrate the neuropsychological characteristics of the four component index scores, we discovered that the mean ± (SD) of the Verbal comprehension index in the male group is 29.63 ± (11.44) and that considered as an average if it compared to the female group in the same mean range 27.75 ± (16.64). Perceptual organization is the second index, the male group shows an average level with 27 ± (7.08) along with the female group 30.87 ± (8.98), the third index is working memory, the males group shows below average score with 15.68 ± (6.39) as well as female group 17.87 ± (8.65). The final index is processing speed, with the male group had below average score 12.31 ± (6.29) as similar to female group 17.75 ± (8.27).

In addition, two of the four indexes found no significant gender differences. Furthermore, there may be slight evidence of differences in the working memory and processing speed indexes indicate a disparity between male and female groups. The mean difference in working memory between the two groups was 16.33 ± (7.03), which is below average, but the most important index to look at is processing speed, which indicates that the females have a better processing speed than the males with a total difference mean of 13.92 ± 7.23.

Discussion

Epilepsy has a prevalence of 6.54 per 1,000 people in Saudi Arabia, considering it a common neurological illness. The neuropsychological characteristics of left temporal lobe epilepsy condition need to be clearly understood and emphasized. There were gender differences in two of the four indexes with no significant in any in the current study, which included verbal comprehension index, perceptual organization index, working memory index, and processing speed index. However, the key results indicated that both males and females performed below average on the working memory test. Similar to a comprehensive review by Zhao, Fengqing et al, published in 2014

the (Table 1). "Studies on the effects of TLE on working memory" a study by Wagner et al. 2009 shows a specific working memory deficit relatively more in the Verbal Working Memory.

Males significantly outperformed females in processing speed, according to a study by Camarata and Woodcock titled "Sex Differences in Processing Speed: Developmental Effects in Males and Females." On the other hand, the females' group demonstrated a good processing speed in comparison to the males' group, which proved the opposite.

However, the male group's Intelligence Quotient (IQ) was below average. This study is a good indicator that adult patients should be admitted in preparation to the epilepsy monitoring unit in Saudi Arabia for EEG examinations.

Limitations and Future Directions

This study's sample size and age grouping restrictions are one of its weaknesses. Future studies should also consider the need to examine cognitive problems utilizing a variety of neuropsychological tests. Additional research is also required on the neuropsychological patterns in Arab countries among epileptic patients.

Conclusion

According to the data studied, assessing the epistemological foundation remains the basis for neuropsychological studies, but new data on the temporal lobe in relation to epilepsy have been introduced heavily into the scope of neurophysiology. In fact, the neuropsychological tests are used extensively in patients with temporal lobe epilepsy, before and after surgery or EEG monitoring, to verify cerebral activities.

Nevertheless, there is some investigations on the neurophysiological functions of the temporal lobe were also compared with more recent data in this investigation. However, a thorough analysis of the neuropsychological tests utilized for the temporal lobe should be performed in order to improve clinical characteristics. These could explain the inconsistent pattern of the outcomes that would be obtained in the future.

Acknowledgments

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