ORIGINAL ARTICLE

NEUROPSYCHOLOGICAL FUNCTIONS IN EPILEPSY PATIENTS

Sana Masood, Rafia Rafique

Department of Applied Psychology, University of the Punjab, Lahore, Pakistan

Background: Neuropsychological impairment can be associated with epilepsy and its different types. The present study investigated gender differences in neuropsychological functions in epileptic patients. It was hypothesized that neuropsychological functioning will be different in male as compared to female epileptic patients. It was also hypothesized that there are significant gender differences among male and female epileptic patients in depression, somatic complaints, memory, communication, aggression and motor impairment. In addition it was hypothesized that neuropsychological functioning among patients diagnosed with different types of epilepsy; grand mal, petit mal, complex partial and generalized tonic clonic will be different. **Method:** A sample of 60 patients was recruited from different hospitals situated in the city of Lahore through purposive sampling technique. To assess neuropsychological functions, Neurobehavioral Functioning Inventory (NFI) was used. NFI was translated and back translated through the process of validation and final version of the scale in Urdu was obtained for use in the study. ANOVA and Student's *t*-test were employed to infer the proposed hypotheses. **Result:** There is significant difference in neuropsychological functioning between male and female epileptic patients on only somatic complaints. Females were found to reveal greater somatic complaints compared to their male counterparts. There are significant differences in neuropsychological functioning among patients diagnosed with different types of epilepsy. **Conclusions:** The study lays ground for future research and holds implications for the implementation of gender based neuropsychological interventions.

Keywords: Neurobehavioral functioning inventory (NFI), grandmal, petit mal, tonic clonic seizure

INTRODUCTION

The growing interest in the field of neurophysiology over last two decades has led many investigators and researchers to examine deficits of performance and neuropsychological tasks[1] in wide variety of neurological disorders including epilepsy. Neuro-psychological impairment is a significant co-morbidity of epilepsy.[2] Prevalence of epilepsy in Pakistan is estimated to be 9.99 per 1,000 with highest frequency seen in people younger than 30 years of age.[3,4]

Recurrent seizures are at times apt to result in disrupted brain functioning leading to problems with retention, attention, controlling behaviour or anger reactions, and mood changes. In short epilepsy has closely been linked with neuropsychological functioning of an individual. Epileptic patients have found to differ on neuropsychological functioning compared to their healthy counterparts. Neuropsychological functioning refers to a complex set of behaviour tasks controlled by brain involving spheres as language, memory, visual perception skills, attention and executive skills.[5]

Usman *et al*[3] conducted a study on the demographic profile of patients with epilepsy. The results showed that majority (62.9%) belonged to low socio-economic status and rural areas of Pakistan, (58%) were men compared to (42%) who were women. The most common type of epilepsy reported was Generalised Tonic Clonic Seizure. However most of the researches undertaken on neuropsychological functioning have been in the west, limited research evidence exists for Pakistan, pointing towards a need to explore this area in a sample of indigenous population.

The findings of a research conducted on gender differences by using modified Halstead-Reitan Neuropsychological Test Battery, revealed that there were significant differences on motor speed and strength measures, however, gender differences on many other subscales of the battery were not found to be statistically significant.[6] Another research conducted to examine gender differences on NFI sub-scales endorsed non significant gender differences for patients diagnosed with epilepsy on depression, memory, aggression and communication deficits; except on two sub-scales, namely, somatic complaints and motor impairment.[7] The current research was undertaken with a primary objective to find out gender differences in neuro-psychological functioning of epileptic patients.

SUBJECTS AND METHODS

Between group research design was employed. The sample consisted of 60 epileptic patients, 30 male and 30 female. Their age ranged between 18 and 35 years. Only patients diagnosed with epilepsy for at least 2 years or more were included. The sample was recruited from General Hospital, Services Hospital, and Ittefaq Hospital, Lahore.

Purposive sampling technique was used for data collection. Patients who were currently on any form of epileptic medication were recruited. Patients who were unable to read and write Urdu language or those with any chromosomal disability, e.g., Down syndrome, Trisomy 13 and 18, Turner's syndrome, Klinefelter syndrome, XYY syndrome; or any hereditary metabolic disorders, such as phenylketonuria, or lipidoses were not included in the study. Moreover patients having any

neurodegenerative diseases, like Alzheimer's disease, Parkinson's disease, Huntington's disease, Amyotrophic Lateral Sclerosis (ALS) or those diagnosed with brain tumour as well as any brain injury, e.g., traumatic brain injury (TBI) were also excluded. Patients having any co-morbid physical or psychiatric illness, and those suffering from malignant diseases or having undergone any surgical procedure were not included in the study. Patients who have been diagnosed with epilepsy before the age of 15 years were excluded from the study.

Information on age, gender, education, marital status, monthly income, residence, and family system, type of diagnosis, duration and family history of epilepsy was inquired.

Neurobehavioral Functioning Inventory (NFI)[7] developed to measure neuropsychological functioning of patients diagnosed with epilepsy. NFI scale was considered invalid if more than 25% of items for scale were not answered.

The Patient Record Form was used to asses neuropsychological functioning in patients diagnosed with epilepsy. NFI was translated and back translated through the process of validation and final version of the scale in Urdu was obtained for our study. NFI was administered on epileptic patients fulfilling the study inclusion/exclusion criteria and it took 20–40 minutes for self administration. Approval of Institutional Ethical Committees was taken. Informed consent was obtained from each subject. Data were analysed using SPSS16.

RESULTS

Mean age of the patients was 25 years and 60% had 10 to 14 years of education. Majority of the sample (82%) belonged to urban areas (Table-1).

Table-1: Demographic variables of patients (n=60)

Variable	No. (%)
Age: Mean age 25.27 (5.30)	-
Education	
Less than 10 years of formal education	24 (40)
Between 10–14 years of education	36 (60)
Marital status	
Married	22 (37)
Single	38 (63)
Monthly Income	
5000–15000	41 (68)
16–25000	14 (23)
26–36000	5 (9)
Area of living	
Urban	49 (82)
Rural	11 (18)
Family system	
Joint	32 (53)
Nuclear	28 (47)
Type of Epilepsy	
Grand mal seizure	15 (25)
Petit mal seizure	24 (40)
Complex partial seizure	7 (12)
Generalized tonic clonic	14 (23)
Duration of Epilepsy	
2–6 years	30 (50)
7–11 years	21 (35)
12–20 years	9 (15)
Family history of Epilepsy	
Yes	5 (8)
No	55 (92)

Reliability analysis for NFI is presented in Table-2. There were significant gender differences between men and women on somatic subscale of NFI (Table-3). Results of ANOVA between and within groups are given in Table-4.

Table-2: Reliability analysis for NFI and its sub-scales

Scale	Mean±SD	Items	Cronbach α
NFI	213.37±49.15	76	0.97
Depression	41.68±8.97	13	0.89
Somatic	29.65±6.73	11	0.82
Memory	45.25±14.13	19	0.93
Communication	27.68±9.59	10	0.90
Aggression	21.45±6.40	9	0.82
Motor	26.05±6.27	8	0.87

Table-3: Difference between male and female epileptic patients on sub-scales of NFI

Variable	Women	Men	*p*	Cohen's d
Depression	43.30±7.85	40.07±9.83	0.17	0.37
Somatic	31.73±7.04	27.57±5.81	0.02	0.66
Memory	45.57±15.53	44.93±12.84	0.86	0.04
Communication	26.93±10.51	26.93±8.69	0.55	0.16
Aggression	22.53±6.52	20.37±6.51	0.19	0.35
Motor	26.47±6.11	25.63±6.20	0.61	0.13

Table-4: ANOVA for NFI and types of diagnosis

Source	SS	df	MS	f	*p*
Between group	42275.48	3	14091.83	7.86	<0.000
Within group	100282.45	56	1790.76		

Significant differences in neuropsychological functioning were found among patients diagnosed with grand and petit mal epilepsy and that between petit mal and generalized epilepsy (Table-5).

Table-5: Tukey HSD comparison for types of diagnosis

Types of epilepsy	Types of epilepsy	Mean difference	SE	95% CI	
				Upper Bound	Lower Bound
Grand mal	Petit mal	62.17*	13.93	25.29	99.05
	Complex	24.58	19.37	-25.81	76.77
	Generalized	13.40	15.73	-28.23	55.04
Petit mal	Grand mal	-62.17*	13.93	-99.05	-25.29
	Complex	-36.7	18.19	-84.82	11.44
	Generalized	-48.76*	14.23	-86.44	-11.08
Complex	Grand mal	-25.48	19.37	-76.77	25.81
	Petit mal	36.7	18.19	-11.44	84.82
	Generalized	-12.07	19.59	-63.94	39.80
Generalized	Grand mal	-13.40	15.73	-55.04	28.23
	Petit mal	48.76*	14.23	11.08	86.44
	Complex	12.07	19.59	-39.80	63.94

*$p<0.05$

DISCUSSION

The findings of present study revealed non-significant gender differences on overall neuropsychological functioning except that significant differences were observed on somatic complaints. A study conducted on gender differences by using modified Halstead- Reitan Neuro-psychological Test Battery, showed that there were significant differences found for 12 of 33 test comparisons, with the pattern of results resembling sex differences found among neurologically normal. Although the most pronounced differences were obtained on motor speed and strength measures.[6] Another study conducted to examine sex roles in each of

NFI sub-scales endorsed no sex differences for patient's reports of depression, memory, aggression and communication deficits, except that for two sub-scales, namely, somatic complaints and motor impairment.[7] The results of the present study reveal that there are non-significant differences in symptoms of depression between male and female epileptic patients. Although females scored higher on depression sub-scale, the differences were not statistically significant. Our findings are consistent with most of the earlier findings.

A study conducted to measure subjective complaints, compared the results of neuropsychological assessment in patients with epilepsy. Findings showed that personality problems, mood disorders and depression are more common among epileptic women, but the difference between genders was non significant.[10] Findings of another study also revealed no sex differences for patient's reports of depression.[7]

Our findings indicate non-significant differences in memory and attention skills between male and female epileptic patients. This finding is consistent with Kreutzer *et al*[7], who found no sex differences for memory. Mameniskie *et al*[10] reported that frequent seizures were related to poor long-term recall and memory. However non-significant gender differences were found on memory and attention skills. Our findings support Mameniskie *et al*.

Our findings highlighted that there are significant difference on somatic complaints between male and female epileptic patients, females reported more somatic deficits and problems like stomach hurts, headaches, dizziness, poor appetite, trouble in falling asleep, and trouble in hearing. This finding is consistent with earlier work[7]. Women reported more somatic complaints compared to men. The findings of this study are comparable to available global evidence. Non-significant differences in communication styles between male and female epileptic patients were found in our study. On the contrary, earlier work shows that male and female patients report difficulty in pronouncing words, slowness in writing, trouble in understanding conversation but gender differences were non-significant.[7] Our study finding is comparable to the result of this study.

Differences in level of aggression between male and female patients were found to be non-significant in our study sample. It may be due to neurons imbalances in brain that both male and female exhibit the same level of aggression especially when the duration of epileptic onset is not very long and the onset is not at a very young age.[7] In our study 50% of the sample had an epileptic onset between 2 and 6 years. The findings revealed non-significant difference on motor impairment in male and female epileptic patients. Contrary evidence exists in this regard exists. Kreutzer *et al* found statistically significant gender differences on motor impairment sub-scale. Females reported more difficulty while lifting heavy objects, and weakness.[7] This may be due the fact that they employed a much older sample of epileptic patients diagnosed with epilepsy at a younger age. In general, men and women tend to score similarly on the majority of psychological constructs including cognitive variables, psychological well-being, and social and personality variables.[9]

There was significant difference in neuropsychological functioning among patients diagnosed with different types of epilepsy. A research[10] studied impairment of long-term recall in everyday functioning of epileptic patients. Their findings showed that on all long-term memory tests, patients with complex partial and secondary generalized seizures did significantly worse than patients with simple partial seizures. The occurrence of interictal generalised or focal temporal epileptiform activity was connected with more accelerated forgetting of the word list and complex figure. Our findings are consistent with results of earlier findings. In our sample patients diagnosed with grand mal had poor neuropsychological functioning compared to patients diagnosed with other types of epilepsy. It can be ascertained that epileptic patients have diverse cognitive profile.[11]

It was important to examine neuropsychological functioning including different aspects of thinking, memory, attention, and problem solving etc. to better be aware of a person's individual profile of abilities and strengths and weaknesses. Moreover, gender specific information obtained from the study will be beneficial for neurophysiologists, psychologists, psychiatrists, workers of rehabilitation in planning assessment and treatments.

Neuropsychologists have a significant role in the assessment, treatment, and rehabilitation of people with epilepsy. Research evidence emphasizes the importance of a well-conducted neuropsychological assessment for the management of individuals with epilepsy at the start of the onset of the seizure.[12] The ultimate goal of neuropsychological assessment is an improvement in overall cognitive, functional or psychological status of an individual who has experienced neurological compromise.[13]

LIMITATIONS

The foremost limitation is the small sample size and the fact that the sample was taken from only one city, thus limiting its generalizability.

CONCLUSION

This study can be considered as a preliminary research on gender differences on neuropsychological assessment of epileptic patients. Cross-sectional studies are valuable, however, cannot give insight into the prospective course of the disorder. Few of the findings

are inconsistent with available evidence and hence further prospective longitudinal research with sound and more advanced research methodology, and a larger sample size is recommended.

REFERENCES

1. Kang DH, Davidson RJ, Coe CL, Wheeler RE, Tomarken AJ, Ershler WB. Frontal brain asymmetry and immune function. Behav Neurosci 1991;105:860–9.
2. Elger CE, Helmstaedter C, Kurthen M. Chronic epilepsy and cognition. Lancet Neurological 2004;3:663–72.
3. Usman S, Chaudhry HR, Asif A, Yousaf A, Jahangir SF, Butt MG, *et al*. Demographic profile of patients with epilepsy in a community clinic. Pak J Med Sci 2007;23(6):873–6.
4. Engel J, Birbeck GL, Diop AG, Jain S, Palmini A, Munsat TL. Epilepsy: Global Issues for Practicing Neurologist. USA: Demos Publishing;2005.
5. Frye RE, Landry SH, Swank PR, Smith KE. Executive dysfunction in poor readers born prematurely at high risk. Dev Neuropsychol 2009;34(3):254–71.
6. Kupke T, Lewis R, Rennick, Phillip M. Gender differences in the neuropsychological functioning of epileptics. J Consult Clinical Psychol 1979;47(6):1128–30.
7. Kreutzer JS, Seel R, Marwitz JH. Neurobehavioral functioning inventory (NFI). USA: The Psychological Corporation;1999.
8. Liika M, Vahter L, Gross-Paju K, Haldre S. Subjective complaints compared to the results of neuropsychological assessment in patients with epilepsy: The influence of co morbid depression. Epilepsy Research 2009;84(2–3):194–200.
9. Hyde JS. The gender similarities hypothesis. American Psychologist 2005;60(6):581–92.
10. Mameniskie R, Jatuzis D, Kaubrys G, Budrys V. The decay of memory between delayed and long-term recall in patients with temporal lobe epilepsy. Epilepsy & Behavior 2005;8(1):278–88.
11. Aikia M, Salmenpera T, Partanen, K, Kalviainen R. Verbal memory in newly diagnosed patients and patients with chronic left temporal lobe epilepsy. Epilepsy Behav 2001;2:20–7.
12. Baker GA, Goldstein LH. The dos and don'ts of neuropsychological assessment in epilepsy. Epilepsy & Behav 2003;5(1):77–80.
13. Allen JB. Treating patients with neuropsychological disorders: A clinician's guide to assessment and referral. USA: American Psychological Association; 2002.

Address for Correspondence:

Dr. Rafia Rafique, Department of Applied Psychology, University of the Punjab, Lahore, Pakistan. **Cell:** +92-300-4215694
Email: rafiawaqar@hotmail.com