

Impairment of Social Cognition among Patients with Epilepsy: A Cross-Sectional Analytical Study in a Tertiary Care Center

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Abstract:

Introduction: Social cognition is defined as one's ability to perceive and understand other people's thoughts, feelings, and behaviour and to respond appropriately. Many neurological disorders affecting the brain leads to disruption in social cognitive function. Many studies which were done among people with epilepsy showed impairment in social cognition, which in turn resulted in impaired quality of life, employability, and other cognitive functions especially in PWE with temporal lobe (TLE) and extratemporal (ETE) epilepsies. Identifying the nature and magnitude of social cognitive impairment in people with epilepsy has both theoretical and clinical implications, including the potential to form guidelines for clinical assessment and psychosocial intervention.

Methodology: Patient more than 18-year-old with epilepsy and who are stable on antiseizure medication (ASM) were included in the study after taking consent. The quality of life of PWE was assessed using the 31-item Quality of Life in Epilepsy inventory (QOLIE-31 translated to local language) QOLIE31. Measures of social cognition include tests of emotion recognition (ER) and the assessment of theory of mind (ToM). Three cognitive tests were used to measure the patients' ability to understand human emotion and behavior.

Results: It was observed that those persons with epilepsy performed worse on ToM task compared to healthy controls. The performance of ToM task among different types of epilepsy was similar. There was significant negative association between ToM tasks and duration of epilepsy and number of antiseizure medication used. The overall quality of life and social function was better in patients who scored more in RMET (Reading of the Mind in the Eyes test) and FPRT (Faux Pas Recognition Test) tasks.

Conclusion: Social cognition is significantly affected by seizure especially when the duration of seizure and number of ASM increases. Overall quality of life is also affected when there is impairment in social cognition. The study shows that a higher performance score in ToM tasks may not be essential to be in a good relationship.

Keywords: People with epilepsy; Quality of life; Social cognition; Strange stories; Temporal lobe epilepsy; Theory of mind.

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Introduction

Social cognition (SC) is defined as ability of a person to perceive and understand other's thoughts, feelings, and behaviours and to respond to it appropriately (1). The main components of social cognition are emotion recognition, theory of mind (ToM) and empathy (1). Emotion recognition is the ability to identify and discriminate emotional states from verbal and nonverbal cues. Theory of mind refers to the ability to understand other people's thought and their feeling and to infer complex mental states, such as intention and disposition, in others. Empathy is the ability of an individual to understand the emotions of others and respond to it aptly. Empathy is an important component of SC which contribute to successful social interaction and to promote prosocial actions. [1] The brain

regions which are linked to the development of social cognition are amygdala, medial prefrontal cortex, temporoparietal junction, anterior cingulate and insula. [2] The process of SC has 3 main domains which are associated with perceptual social perception, social understanding and social decision making [3]

Many of the neurological disorders which affect the brain leads to disruption in social cognitive function. Social cognition gets impaired in conditions that results in of acute brain damage like traumatic brain injury and stroke. In diseases like behavioural-variant frontotemporal dementia (bvFTD), impairment of social cognition may be the core clinical feature. Many studies conducted among people with epilepsy demonstrated impairments in social

cognition which in turn resulted in impaired the quality of life, employability, and other cognitive functions [4] especially in PWE with temporal lobe (TLE) and extratemporal (ETE) epilepsies [5-8]. Identifying the nature and magnitude of social cognitive impairments in people with epilepsy has both theoretical and clinical implications, including the potential to inform guidelines for clinical assessment and psychosocial intervention [1]. Measures of social cognition include tests of emotion recognition (ER) and the assessment of theory of mind (ToM). [9]. Many researches were conducted at different times to establish a relationship between measures of quality of life and social cognition (SC), but the possible influence of impaired SC on real-life outcomes has not been reported. To avoid estimation errors or bias, objective methods are used here to measure the social and professional circumstances of the candidates [9]

Objective

Primary objective: To assess the performance of patients with different types of epilepsies in ToM tasks

Secondary objectives: To find the association between epilepsy variables and SC. To determine whether emotion recognition (ER) and ToM are associated with the quality of life, level of education and being in a relationship.

Study population: All patients with epilepsy aged > 18 years, attending TVMCH neurology department

Sample: All patients with epilepsy attending Neurology department between August 2022 to December 2023

Study design: Cross sectional analytical study

Methodology

Inclusion criteria: Patients with epilepsy aged > 18 years and who are on stable antiseizure medication (ASM) are included in the study after obtaining consent.

Exclusion Criteria: Patients with confirmed psychiatric or neurodevelopmental conditions (e.g., depression, autism spectrum disorder, intellectual disability), patients with drug or alcohol abuse patients with traumatic brain injury and those with sensory/motor deficits that would evidently prevent the comprehension and completion of cognitive tasks were excluded from the study

Methods

An informed consent was obtained from all eligible patients before entering the study. Clinical variables (typed of seizure and frequency, ASMs), EEG and neuroimaging data were collected from history and medical records. ILAE criteria was used to diagnose and categorize different seizure types. The National Hospital Seizure Severity Scale

(NHS-3) was used to evaluate seizure severity. The quality of life of PWE was assessed using the 31-item Quality of Life in Epilepsy inventory (QOLIE-31) translated to local language [10]. The components under QOLIE-31 are emotional well-being, energy/fatigue, cognitive function, medication effects, overall quality of life, seizure worry, and social function. Were used for further analysis. Score for each component is measured and total score is found out.

Three cognitive tests were used to measure the patients' ability to understand human emotion and behavior. The Reading of the Mind in the Eyes test (RMET) includes 36 eye photos. The participant was asked to describe the mental status of the person which is shown in the photo by looking into the picture. He can select one of four emotions that best describes mental state each correct answer gets a score of one point and the total score was calculated. [11,12]. The Faux Pas Recognition Test (FPRT) consisted of six stories that described situations which included socially inappropriate behavior. The FPRT was scored based on responses to six questions. The patient has to understand different components of the story which are detecting faux pas (two questions), understanding inappropriateness, recognizing the character's intentions, beliefs, and being able to empathize [13,14]. The Happé strange stories test (HST) comprised of stories that has eight situations. The participant had to detect a lie, white lie, bluffing, persuasion or misunderstanding presented in different social situations.

Each story was scored on one point scale, depending on the patient's ability to interpret the situation [15,16]. A translated local language version was used for testing both the tests. The performance in TOM task for patients with each types of seizure was measured. Association between impairment in social cognition and different types of epilepsy was assessed. Association of theory of mind task scores with the quality of life, level of education and employment were assessed. The tests of social cognition had been adapted and validated for the population prior to the current study.

Statistical Analysis

Analysis was performed using SPSS 25.0 software for Windows. Categorical data was analyzed using Chi square (χ^2) and Fisher's exact tests. Mann-Whitney U, Kruskal Wallis H tests and Spearman's correlation were used for the analysis of ordinal or non-normally distributed variables. Normally distributed data were described using the Student's t test and one-way ANOVA. Binary logistic regression was used in search of variables associated with achieving higher education and being employed. Ordinal logistic regression was used to find rela-

tionships between tests of SC and the level of achieved education.

A multiple linear regression model was used in search of QOLIE31-related variables. For all tests, p value of less than or equal to 0.05 was considered statistically significant.

Results

The total number of study subjects was 164, out of which there were 77 males and 87 females. ToM task which was done on a control group of 60 healthy individuals (30 males and 30 females) was used for comparison with study group. Among 164 participants, 54 was diagnosed with genetic generalized, 50 with temporal and 60 with extratemporal epilepsy. (Table 1)

Table 1: Baseline Characteristics of the Study Subjects (n=164)

	GGE(n=54)	ETE(n=60)	TLE(n=50)
Male: Female	18:36	27:33	32:18
Age in years	28(18-56)	30(19-66)	34(20-52)
Years of Epilepsy	6.72	10.64	7.68
ASM			
0	-	-	-
1	32	18	14
2	14	26	20
3	6	12	10
4 or more	2	4	6
MRI lesion	4(8%)	26(43.3%)	33(66%)
Seizure frequency	2	2	2
Employed	23(42.5%)	28(46.6%)	19(38%)
Single			
Married	18(33.3%)	29(48.33%)	22(44%)
Divorced	2	1	2

ASM: Antiseizure Medication, ETE: Extra temporal epilepsy, GGE: Genetic generalised epilepsy, TLE: Temporal lobe epilepsy

Level of education achieved did not differ among groups of different types of epilepsy statistically or among healthy controls. HC scored more in HST test than people with epilepsy (PWE) (U=910.0, P<0.001). In FPRT, PWE scored lower scores in understanding inappropriateness (U=1412.5, P=0.052) and intentions (U=1642, P=0.043) compared to healthy controls. Other parameters showed similar score in both HCs and PWE.

HST(H=4.182, P=0.126) and FPRT (F=2.612, P=0.126) scores were similar in participants with TLE, ETE and GGE.(Table 2) Among PWE there was no gender or age difference in results of any of the cognitive tests. Cognitive tests scores showed association with the number of antiseizure

medication used (rs= -0.322 P=0.022 for RMET, rs= -0.374 P=0.001 for HST and rs= -0.372 P=0.024 for FPRT) There was no association between cognitive test performance and frequency of seizures. Duration of epilepsy was associated with results of HST (rs= -0.266 P=0.002) and FPRT (rs= -0.342 P=0.012), but no association was found with RMT.

There was correlation between cognitive test and level of education (rs=0.462 P<0.001 for HST, rs=0.474 P<0.001 for RMET and rs= 0.324 P=0.021 for FPRT) Cognitive test results showed no difference among PWE who were single, married or divorced.

Table 2: Comparison of social cognitive test between people with epilepsy and Healthy controls

	GGE(n=54)	ETE(n=60)	TLE(n=50)	HCS
FPRT				
Number of faux pass stories detected	5(2-6)	5(1-6)	5(2-6)	5(2-6)
Number of control stories detected	3	3	3	3
Faux pass detection in stories	10(4-12)	10(4-12)	10(2-12)	10(4-12)
Understanding inappropriateness	4(0-6)	4(0-6)	4(0-6)	5(2-6)
Intentions	2(0-5)	2(0-4)	2(0-5)	4(2-6)
Belief	3(0-6)	3(0-6)	3(0-6)	3(0-6)
Empathy	4(1-6)	4(1-6)	4(1-6)	4(1-6)
HST	12(6-14)	12(6-14)	11(6-12)	15(8-16)
RMET	28.64(4.6)	26.85(3.64)	28.36(4.78)	

FPRT: Faux Pas Recognition Test, HST: The Happé strange stories test, RMET: Reading of the Mind in the Eyes test

There was significant association between RMET ($r_s=0.266$ $P=0.012$) and FPRT ($r_s=0.326$ $P=0.034$) with total QOLIE-31 score.

Also, statistically significant correlation was found between overall quality of life ($r_s=0.264$ $P=0.022$), social function ($r_s=0.344$ $P=0.014$) and cognitive

functioning ($r_s=0.262$ $P=0.024$) with RMET score. FPRT was associated with emotional wellbeing ($r_s=0.316$ $P=0.002$) and social function ($r_s=0.336$ $P=0.031$).

There was no association found between HST and QOLIE.

Table 3: Comparison of quality of life among people with epilepsy

	GGE(n=54)	ETE(n=60)	TLE(n=50)
Seizure worry	62.32	56.46	58.52
Overall QoL	66.06	63.75	61.84
Emotional well-Being	70.04	68.40	56.44
Energy/Fatigue	67.24	61.43	57.82
Cognitive	60.50	62.33	68.56
Medication effects	60.10	64.92	64.66
Social function	78.26	68.34	72.60
QOLIE-31 total score	66.36	63.66	54.56

Discussion:

Primary objective of this study was to assess the performance of patients with different types of epilepsies in ToM tasks. Our studies showed that those persons with epilepsy perform worse on ToM task compared to healthy controls. These findings confirmed reports from many other research papers in the past which also had similar results [17-19]. The study shows that even in persons with GGE there is impairment in performance of ToM tasks. In our study there was no difference in performance of empathy and ER tasks in participants with TLE and GGE, but study done by Morou N et al found out that there was worse performance ToM tasks among participants with focal epilepsies as compared to HC or with GGE patients [20,21].

In the performance of HST test, the scores were similar in all of the groups among PWE. But there was significant lower score in HST performance among PWE compared to healthy controls. Similar result was also described in a research paper by A Jasionis et al in 2021 in which the study showed lower scores in performance in HST test among PWE [9]. These results shows that performance in HST is impaired more compared to other ToM tasks in PWE and this can be explained by the postulation that it could be formed early in life along with other cognitive domains and also may be more prone get impaired by epileptic activity. And among PWE, people with TLE scored lowest in HST task which indicate more impaired social cognition among them. The RMET test scored similar in all participants among PWE.

We could not get any evidence to suggest an association of ToM tasks with age or sex. But there was a clear cut significant negative association between ToM tasks with duration of epilepsy and with number of antiseizure medication used. This may indicate that the burden of multiple ASM, side effects of many drugs and its interactions and also the

duration of epilepsy have significant effects on the social cognitive functions.[9,22]. There was a positive association between social cognition tasks and total QOLIE-31 score. The overall quality of life and social function was better in patients who scored more in RMET and FPRT tasks. Similar results were described by A Jasionis et al in the research conducted in people with epilepsy [9].

We could find a positive association between level of education and performance of ToM tasks. The scores were more among participants who had higher level of education. This may indicate that even though the ability to perform in various ToM tasks develop in early childhood, further development of these abilities and development of advanced ToM happens during adolescent period when higher education is achieved by people .A study done by A Jasionis et al among people with epilepsy showed similar positive association between level of education and HST and RMET test scores [9]. But a recent study done by Giovagnoli, A.R in the healthy population provided evidence that ToM is not associated to level of education [23]. As per definition, impaired ToM creates difficulties in understanding thoughts or feelings of his/her partner. But there was no association found between ToM tasks performance and being in a relationship or or living single. This may indicate that good performance in ToM is not essential to be in a good relationship.

Conclusion

This study provides evidence that there is significant impairment in social cognition in people with epilepsy compared to age matched healthy controls and the ASM burden and duration of epilepsy affects the ToM tasks negatively. Though the study showed a positive correlation between overall quality of life and social cognition, to confirm this relationship further studies are needed as our study was a cross sectional study with limited sample size .

The study shows that a higher performance score in ToM tasks may not be essential to be in a good relationship.

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