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PSYCHOLOGY AND PSYCHIATRY
Research Article

Aspects Related with Cognitive Impairment in Children with Epilepsy

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Received: July 07, 2020; **Published:** October 31, 2020

Abstract

Introduction: The focus of the present study is to identify the effects of cognitive impairment and how children with epilepsy copes with them.

Methods: A sample of 100 epileptic patients (N = 55) female and (N = 45) male, aged between 6 and 11 years. Montreal Cognitive Assessment scale (MoCA) and Raven's Standard Progressive Matrices (IQ) to children with epilepsy, were used for the development of research.

Results: Patients with epilepsy in general experience low levels of cognitive impairments, a normal average of IQ. There is a significant negative relation between neurological problems ($r = -.666$, $p \leq 0.01$), in addition to electroencephalogram (EEG) and structural neuroimaging with magnetic resonance imaging (MRI) ($r = -.560$, $p \leq 0.01$) and cognitive development. IQ is an important indicator of cognitive development and how the children cope with others.

Conclusion: The cause of cognitive impairment in patients with epilepsy seems to be multifactorial, factors as the type of epilepsy, age of first seizure, frequency of seizures, duration of epilepsy, and its treatment are considered important. Studies shows that cognitive impairment before the first recognized seizure and microstructural and functional alteration of the brain at onset of epilepsy suggest the influence of neurobiological mechanism between epilepsy and cognitive comorbidity, coefficient of intelligence (IQ) in patients with epilepsy.

Keywords: *Epilepsy; Children; Cognitive Impairments; General Intelligence; Behavioral Problems*

Introduction

Epilepsy affects the life of the child and his family in a radical way. The process can be facilitated by the proper but also early diagnosis of the type of epilepsy and the affected areas that associate this disease. Early diagnosis gives the opportunity to prevent a number of developmental problems related to cognitive impairments. An identification of cognitive problems gives the opportunity to provide early developmental interventions, appropriate school programs, professional counseling, supportive work environments and safe environments to promote independence throughout the lives of children with epilepsy [1]. Early and complete control of epileptic seizures and normalization of the EEG are necessary to prevent cognitive problems in younger patients or to prevent accelerated cognitive decline [2].

Selection of anti-epileptic drugs that are necessary to control the crisis requires more attention from specialists to consider the minimal effects in terms of cognitive development, slow titration and use of lower doses, the effectiveness of anti-epileptic medications, avoidance of polypharmacy and treatment of comorbid neuropsychiatric disorders are also important to keep under control the impact of side effects caused by uncontrolled drug administration [3-5] on the cognitive development of children with epilepsy. Most patients diagnosed with epilepsy have normal levels of intelligence, while some have an above-average IQ. Various factors can adversely affect cerebral impairments [6] that appear before the onset of seizures such as: type of convulsion, age at onset of epilepsy, frequency, duration and severity of convulsions, intraictal and interictal physiological dysfunction due to convulsions, cerebral structural damage due to repeated or prolonged convulsions, hereditary factors, psychosocial factors, post-operative conditions of epilepsy, and side effects of anti-epileptic medications [7-9]. Crisis etiology may be one of the most influential factors in the cognitive development of children [10]. In general, the earlier the age of onset of seizures, the more likely the patient is to have cognitive impairment, while patients with mental retardation are more likely to have refractory epilepsy [3,11,12]. The frequency, duration, and severity of seizures can affect cognition in a variety of ways [13,14]. Apparently, cognition is significantly impaired when consciousness changes during generalized crises or complex partial crises.

Factors that are indirectly related to epilepsy may have an impact on cognition. Hereditary factors strongly influence intelligence. In fact, maternal IQ is the most influential factor in general in predicting a child's IQ [15,16]. Psychosocial factors can negatively affect cognition through mechanisms such as depression or environmental factors [17].

And finally, surgical or pharmacological interventions for the treatment of epileptic seizures can give negative effects in terms of cognitive development. Epilepsy surgery usually does not produce a general cognitive decline because it mainly removes dysfunctional tissue [10,18]. However, significant postoperative cognitive deficits may occur occasionally. For example, left temporal lobotomy may result in decreased verbal memory, especially if there is no gliosis or atrophy of the hippocampus and other structures of the mesial temporal lobe [19].

The risk of a decrease in verbal memory is also greater if memory performance is high after injection with amobarbital into the right intracarotid. On the other hand, a decrease in visual-spatial memory is unstable after right temporal lobotomy. Rarely, unilateral temporal lobotomy may result in severe global anterograde memory disorders. When there is significant dysfunction of the mesial temporal lobe contralateral to lobotomy, the remaining cerebral substrate for memory formation will be insufficient. Fortunately, modern advances in postoperative assessment techniques have minimized this risk.

Methods

The aim of this study is to establish a clear picture of all the congenital implications which interfere with the course of clinical prognosis and the long-term impact on the child's developmental process.

Research questions

1. Are there any significant statistical differences in the overall level of cognitive problems (MoCA) according to the changes in brain waves recorded in magnetic resonance imaging (MRI) in children with epilepsy (N = 100)?

2. Are there any significant statistical differences in the overall level of IQ according to the changes in brain waves recorded in magnetic resonance imaging (MRI) in children with epilepsy (N = 100)?

3. What is the relationship between the type of neurological deficit and cognitive development (MoCA) in children with epilepsy?

4. What is the relationship between neurological deficit type and IQ in children with epilepsy?

5. What is the relationship between structural changes in MRI and IQ in children with epilepsy?

Procedures

Medical data and results from previous psychological assessments were reviewed retrospectively based on the hospitalization history where the children were first diagnosed and the medical documentation they possessed. The selection of a group of patients children was done by randomization stratified from the database on patients with epilepsy at the Pediatric Clinic of SHSKUK and a group at the Hope Center. The interview and testing was conducted within the neurology clinic. For a group of children with whom it has been working at the "Hope" psychological outpatient center, the parents of the children were asked for medical documentation to verify the EEG and MRI medical data.

Medical data including demographic factors, duration of treatment (1 year, 1 - 3 years and more than 3 years), type of epileptic seizure (generalized, partial and generalized partial), electroencephalography (EEG), brain imaging with 1.5 T MRI, number of current antiepileptic drugs (one antiepileptic, two antiepileptics and 3 or more antiepileptics) and neurological deficits. Parents have reported convulsions during the day of assessment or the night before so that the child is not psychologically exhausted due to any epileptic seizures. If a crisis within 24 hours has been reported, testing has not been performed. Parental informed consent is obtained for all children participating in the study and the institution approves the implementation of this study. Ethics have been respected in all the steps of this study by the researchers.

Instruments

MOCA Test (Montreal Cognitive Assessment). The Montreal Cognition Assessment is designed as a tool for rapid screening for mild cognitive impairment. This test assesses various cognitive areas such as: attention and concentration, executive functions, memory, speech/language, visual constructivist skills, conceptual thinking, calculations and orientation. The time to administer MOCA is about 10 minutes. The overall possible score is 30 points; a score of 26 points or higher is considered normal.

Raven's progressive color matrice for kids. This test is designed to measure fluid and crystallized intelligence (IQ) in children who have normal development in cognitive and motor functions. It is called progressive because it starts with lighter affirmations becoming more difficult, while color test is named after Raven used the color test to be more attractive to children. This test belongs to the group of nonverbal tests.

Standardized neuropsychological and psychological tests for Kosovo were used by experts in the field of psychology to measure cognitive impairment and IQ. Psychological assessments are administered by the clinical psychologist. Some of the children who have not been able to participate in the standardized psychological assessment, the level of cognitive functioning was determined by medical and psychological data, parental reports, and when available, observations. Cognitive functioning was classified as normal (IQ ≥ 70), mild retardation (IQ = 50 - 69), moderate (35 - 49), and severe/deep retardation (< 34).

Sample

A sample of 100 epileptic patients (N = 55) female and (N = 45) male, aged between 6 and 11 years of whom 13 children were 6 years old, 16 were 7 years old, 19 were 8 years old, 23 were 9 years old, 14 were 10 years old and 15 were 11 years old. Children's mean age was 8.5 years (DS = 1.59). In the 1st grade we have 14 children, the 2nd grade were 14 children, the 3rd grade were 26 children, the 4th grade were 18 children, the 5th grade were 18 children and in the 6th grade there were 10 children.

Data analysis

Data analysis was performed through the statistical program SPSS- 20. The correlations were tested with Pearson coefficients. Significant difference will be defined at $p < 0.05$. Since all research variables were three-level (e.g. Panic Attack Type: 1. Generalized, 2. Partial, 3. Generalized Partial), then ANOVA was used, which enabled the comparison of the averages of each group. Also, to see the correlation between the variables of this research and to reconfirm ANOVA's findings, Pearson's correlation was used, which enables the identification of correlations.

Results

Data generated by the Electroencephalogram (EEG) test used to assess electrical activity in the brain and to detect problems in the electrical activity of the brain that may accompany epilepsy disorder in children allows us to confirm or exclude other neurological conditions. Based on the imaging records on the electroencephalogram (EEG) it is revealed that in N = 12 (12%) of children diagnosed with epilepsy the presence of EEG results is unchanged, which means that there are not any brain disorders. It results that in N = 30 (30%) of epileptic children based on the frequency of waves recorded in the EEG there are slight changes in brain activity, while in N = 40 (40%) of the sample, epilepsy disorder is characterized by moderate changes in the electrical activity of the brain.

Referring to data on the assessment of electrical activity of the brain, the EEG shows evidences on the presence of a pronounced deficiency in about N = 18 (18%) of children diagnosed with epilepsy. Based on the data of the sample on the electrical activity of the brain, it results that in the majority of children (N = 40%) participating in this study, the presence of a moderate change in brain activity is evidenced. So, we can infer that the most common frequency is revealed for the brain electrical activity with moderate changes in children diagnosed with epilepsy.

Neuroimaging of the nervous system (MRI) allows us to have evidences on how the brain of children with epilepsy reacts to various incentives and can give us information on the presence of various abnormalities in its structure and function. Magnetic Resonance Imaging (MRI) shows the changes recorded in the N = 100 study sample of children diagnosed with epilepsy, of whom N = 65 (65%) present an unchanged MRI in terms of brain structure and function. In about N = 23 (23%) of children diagnosed with epilepsy, there is a presence of mild changes in MRI, while in N = 12 (12%) of the children participating in the study it is revealed that the changes recorded in MRI are of a severed level, indicating a brain function compromise. Data on how the brain of children with epilepsy is structured and functioning shows that about 65% of our sample did not manifest any changes, so it can be noticed that epileptic children with a lack of changes in MRI have a higher frequency compared to others.

Data collected by the measuring instruments on epileptic children's for cognitive problems are related to issues such as attention, executive skills, short-term memory, spoken language, abstract thinking, number calculation, orientation and visual-spatial skills. Referring to the assessment of cognitive problems (dysfunction) in children with epilepsy through the MoCA test, for the global scale the average value of cognitive problems is M = 18.9, DS = 13.5. So, in the overall we can imply that the surveyed epileptic children generally do not show symptoms of cognitive problems. There are children who exhibit cognitive issues at severe levels (minimum = 0), but there are also children who exhibit very good cognitive functioning with values above the average (maximum= 28), M= 18.9; DS = 13.5. So, this overall result means that there are children who are extreme in terms of their values, there are children who present cognitive problems at severe levels, others who do not present any cognitive problems, and yet some others who show a function above the normal in terms of the cognitive field. Based on the severity of the symptoms of epilepsy, four groups are defined. They are created depending on: the difficulties encountered without the presence of a neurological deficit and difficulties with mild, moderate and severe deficiency. The results show that from the difference between the mean value of the group of children without deficit and those with mild deficit M = 16.5, DS = 2.99, we

can infer that the group of children without deficit gained higher values on the mean compared to the group of children with mild deficit. So, the number of children with epilepsy without deficit is higher compared to the group of children with mild deficiency. Referring to the differences in the value of statistical significance p = 0.00 < 0.05 we say that in general there seems to be a difference between the group of children without deficit and that with mild deficit for the general level of cognitive problems. The group without deficit is the one that has gained the high scores in relation to all other groups and such differences are statistically significant.

Regarding the differences in the mean values from the comparison of the group of children without deficit and those with moderate deficit M = 13.5, DS = 3.61, the higher values are represented in the group of children without deficit. So, we can say that the number of children without deficit is higher compared to children with moderate deficit. From the analysis of the differences of the means, it results that the value of the statistical significance is p = 0.02 < 0.05. We can imply therefore that there are differences in the general level of cognitive problems between the group of children without deficit and those with moderate deficit.

The analysis of the comparison of the mean values for the group of children without deficit with the group of children with severe deficits M = 17.5, DS = 8.27 shows that this group is the one that has gained the highest scores in relation to all other groups but also in relation to the group comparing with those of severe deficits. Regarding the statistically significant differences, the value of p = 0.22 > 0.05 shows that in general there do not seem to be statistically significant differences in the overall level of presence of cognitive problems between the group of children without deficit and those with severe deficit.

			Diff.in means	Std. Dev.	Significance
MOCA	w\out deficit	Mild deficit	16.55617*	2.99824	.000
	w\out deficit	Moderate deficit	13.52985*	3.61590	.002
	w\out deficit	Severe deficit	17.52985	8.27757	.221
	Mild deficit	Moderate deficit	-3.02632	4.25348	1.000
	Mild deficit	Severe deficit	.97368	8.57529	1.000
	Moderate deficit	Severe deficit	4.00000	8.81027	1.000

Table 1: *Comparison of the mean values of the level of cognitive problems (MoCA) according to the type of epileptic seizure (N = 100).*

Are there any significant statistical differences in the overall level of IQ according to the type of epileptic seizure in children (N = 100)?

Cognitive development based on aspects related to fluid and crystallized intelligence enables us to determine the IQ based on the ability of epileptic children to reproduce information accumulated through education and on interaction with the environment. Results show that from the difference between the mean value of the group of children without deficit and those with mild deficit M = 11.8, DS = 7.88 we can imply that the group of children without deficit scores higher on means values compared to the group of children with mild deficit. So, the number of children with epilepsy without deficit is higher compared to the group of children with mild deficiency. Referring to the differences in the value of statistical significance p = 0.81 > 0.05 we imply that in general there seems to be no difference between the group of children without deficit and those with mild deficit for the overall level of the IQ. The group without deficit is the one that has scored the low points in relation to all other groups. So, the group without deficit represents higher values of the intelligence ratio compared to the group of children with mild deficit, but it seems that these values are random.

Regarding differences in the mean values from the comparison of the group of children without deficit and those with moderate deficit M = 13.5, DS = 3.61, they represent higher values for the group of children without deficit. Then, we can refer that the number of children

without deficit is higher compared to children with moderate deficit. From the analysis of the differences in the means it results that the value of the statistical significance is p = 0.02 <0.05.Generaly there seems to be differences in the overall level of cognitive problems between the group of children without deficit and those with moderate deficit.

Comparing the mean values for the group of children without deficits with the group of children with moderate deficits M = 68.4, DS = 9.50, it is revealed that this group is the one that has gained the highest scores in relation to the group with moderate deficits. In terms of statistically significant differences, the value of p = 0.00 < 0.05 shows that in general there seems to be statistically significant differences in the overall level of intelligence coefficient between the group of children without deficit and those with moderate deficit.

The analysis of the comparison of the mean values for the group of children without deficit with the group of children with severe deficits M = 205.7, DS = 21.7 shows that this group is the one that has gained the highest scores in relation to all other groups but also in relation to the group comparing to those with severe deficits. In terms of statistically significant differences, the value of p = 0.00 < 0.05 shows that in general there seems to be statistically significant differences in the overall level of IQ between the group of children without deficits and those with severe deficits.

Differences in the mean for the overall level of intelligence coefficient for the group of children with mild and moderate deficits M = 56.6, DS = 11.1, shows that this group has the largest number of children compared to the number of children with moderate deficit. Referring to the value of the significance p = 0.00 <0.05 we imply that in general there seems to be significant statistical differences for the IQ between the group of children with mild and moderate deficiency.

Regarding the score comparison for the mean value of the IQ, it is equal to M = 137.3, DS = 23.1 for the group of children with moderate deficit and that with severe deficit. As it can be seen, the number of children with moderate deficits is higher than the group of children with severe deficiencies. Given that the value of statistical significance is p = 0.00 < 0.05 we accept that between the two groups there seems to be statistically significant differences in the overall level of IQ between the group of children with moderate deficit and the group of children with severe deficit. The IQ is higher in children with moderate deficits.

			Diff.in means	Std. Dev	Significance
IQ	w\out deficit	Mild deficit	11.84368	7.88362	.818
	w\out deficit	Moderate deficit	68.45771*	9.50772	.000
	w\out deficit	Severe deficit	205.79104*	21.76521	.000
	Mild deficit	Moderate deficit	56.61404*	11.18418	.000
	Mild deficit	Severe deficit	193.94737*	22.54803	.000
	Moderate deficit	Severe deficit	-137.33333*	23.16590	.000

Table 2: *Comparison of mean values of the level of IQ according to the type of epileptic seizure (N = 100).*

Based on the differences in the overall means value of cognitive problems (MoCA) from the comparison of the group of children without changes in MRI and the group with mild changes in MRI, M = 15.1, DS = 2.8, shows that this group is the one that has gained the highest scores compared to other groups as well as the MRI group. Regarding statistically significant differences, the value of p = 0.00 < 0.05 shows that in general there seems to be statistically significant differences in the overall level of cognitive problems between the group of children without changes in MRI and those with mild changes. So, we conclude that the relationship between these two variables is not statistically random.

In general, children with surveyed epilepsy have a difference in the mean value for the level of cognitive problems (MoCA) between the group of children without changes in MRI and the group of children with significant changes in MRI, M = 14.1, DS = 3.66. Referring to these

values, we can imply that the number of children without changes in MRI is higher compared to the group of children with significant changes in MRI. The result on the value of the significance p = 0.001 < 0.05 shows that in general there seems to be significant statistical differences for cognitive problems between the group of children without changes in MRI and those with marked changes in MRI. Thus, the relationship between these variables might not just be random.

It results that the differences in the mean values of cognitive problems (MoCA) M = - 0.96, DS = 4.1 for the group of children with mild changes in MRI and those with marked changes in MRI. We can imply that the number of children with mild changes in MRI is greater than the group of children with significant changes in MRI. Given that the value of statistical significance is p = 1.00 <0.05 we accept that there seems to be no difference between the two groups. statistically significant at the overall level of cognitive problems between the group of children with mild changes in MRI and the group of children with marked changes in MRI.

			Diff.in means	Std. Dev	Significance
Total MOCA	w\out change	Mild	15.13579*	2.82780	.000
	w\out change	Severe	14.17564*	3.66206	.001
	Mild	Severe	-.96014	4.15056	1.000

Table 3: *Comparison of the mean values of the level of cognitive problems (MoCA) according to the changes of magnetic resonance imaging in children with epilepsy (N = 100).*

Are there significant statistical differences in the overall level of IQ according to the changes in brain waves recorded in magnetic resonance imaging (MRI) in children with epilepsy (N = 100)?

Based on the differences of the overall means value of the IQ through the comparison of groups of children without changes in MRI and the group with mild changes in MRI is M = 22, DS = 9.1 and it shows that this group is the one that has scored the lowest points compared to the other two groups as well as the group with mild changes in MRI. Regarding the statistically significant differences, the value p = 0.55 > 0.05 shows that in general there seems to be no statistically significant differences in the overall level of IQ between the group of children without changes in MRI and those with mild changes. So, we can refer that the relationship between the two variables is considered to be statistically random.

Data revealed that children with epilepsy generally have a difference in the average value for the level of IQ between the group of children without changes in MRI and the group of children with significant changes in MRI, specifically: M = 83.2, DS = 11.8. Referring to these values, we can say that the number of children without changes in MRI is higher compared to other groups. The result on the value of the significance p = 0.00 <0.05 shows that in general there seems to be significant statistical differences for the IQ between the group of children without changes in MRI and those with marked changes in MRI, so we can refer that the connection between them cannot be random.

Finally, it was evidenced the difference in the means of the IQ M = 61.2, DS = 13.4 for the group of children with mild changes in MRI and those with significant changes in MRI. We can imply therefore that the number of children with mild changes in MRI is greater than the group of children with significant changes in MRI. Given that the value of statistical significance is p = 0.00 < 0.05 we accept that there seems to be statistically significant differences between the two groups at the overall level of intelligence coefficient between the group of children with mild changes in MRI with the group of children with marked changes in MRI.

			Diff.in means	Std. Dev	Significance
IQ	w\out change	Mild	22.05953	9.18253	.055
	w\out change	Severe	83.27692*	11.89159	.000
	Mild	Severe	61.21739*	13.47787	.000

Table 4: *Comparison of mean values of IQ according to changes in magnetic resonance imaging in children with epilepsy (N = 100).*

Given that the value of Sig. (2 tailed) is p = 0.01 < 0.05, then it is concluded that the relationship between the two variables being analyzed (general cognitive development and IQ) is statistically significant. The Pearson correlation coefficient value is r = .300. This implies that the relationship between the two variables is positive and moderate. The higher the cognitive development of children with epilepsy, the higher the level of their IQ. The more issues in cognitive or the lower their cognitive development, the lower the level of intelligence coefficient will be.

Given that the value of Sig. (2 tailed) is p = 0.01 < 0.05, then it is concluded that the relationship between the two variables being analyzed (type of neurological deficit and cognitive development) is statistically significant. The value of the Pearson correlation coefficients r = -.469. This indicates that the relationship between the two variables is negative and of moderate severity. The more severe the type of neurological deficit, the more problems in the cognitive development of children with epilepsy. The milder the type of neurological deficit, the higher the scores in cognitive development in children with epilepsy.

Given that the value of Sig. (2 tailed) is p = 0.01 < 0.05, then we might conclude that the relationship between the two variables being analyzed (the type of neurological deficit and the intelligence coefficient) is statistically significant. The value of the Pearson correlation coefficient is r = -.666. This indicates that the relationship between the two variables is negative and strong. The more severe the type of neurological deficit in children with epilepsy, the lower the IQ. The milder the neurological deficit type, the higher the IQ in children with epilepsy.

Discussion

Research on a number of factors, including possible damage associated with epilepsy, results in the inclusion of a wide range of difficulties that compromise the positive progression of epileptic disorder [18]. Among them it results that difficulties can appear in the cognitive aspect, the psychiatric status of the child diagnosed with epilepsy, as well as in the social adaptive functions [17]. The children participating in the study show a cognitive functioning close to normal parameters and it seems that epileptic disorder has not become a condition for the development of cognitive problems. The MoCA results show a mild level in most children and in some children, we have no evidence of cognitive problems. However, it is worth nothing that in a small number of children the level of cognitive problems ranges from moderate to severe. Cognitive problems tend to worsen and turn into strong barriers for the child affected by the type of neurological deficit that accompanies epilepsy. This means that if children diagnosed with epilepsy are observed to be associated with a mild or moderate neurological deficit, the chances of experiencing cognitive dysfunction due to the severity of their symptoms will increase. The probability that children with moderate neurological deficits show more problems in the cognitive area is higher compared to children with mild epileptic seizures. Our findings are also supported by the study of Choi., *et al*. [10] linking cognitive problems to the presence of neurological deficits and damage or neurodegradation of the central nervous system.

Referring to the type of neurological deficit in children with epilepsy, it is seen that the risk of cognitive impairment is higher in those children who have moderate and severe neurological deficits and are associated with persistent epileptic seizures. Children with moderate to severe deficits have more difficulty with spoken language, visual-spatial functions, and executive functions compared to healthy children [12]. Mainly in a large part of children, the way their brain responds objectively to the environment shows us that simple perception of the environment and people, judgment, attention, skills to perform complex mathematical calculations, skills to use spoken language for communicating their needs, memory, time and space orientation, executive functioning are aspects which are generally close to normal parameters.

Referring to cognitive problems which appeared at moderate to severe levels in a small number of epileptic children, they manifest themselves with difficulty in short-term memory, accompanied by a moderate decrease in executive functions, psychomotor speed, naming skills and visual-spatial ones. Referring to studies [4,5,20] the results regarding the implications that the disorder of epilepsy has on

cognitive function the data are often contradictory. According to studies, it seems that some internalizing issues [14,21,22] as the presence of depression, anxiety, which are reported as common in patients epileptic, affect the decline in psychomotor speed.

The presence of these problems according to studies [8,23] has an impact on children's cognitive performance, increasing the side effects of antiepileptic drugs, and that increased likelihood of developing epilepsy compared to children without problems with depression. It also appears that some specific cognitive problems such as memory problems, attention, executive functions, object naming skills, verbal skills, may increase with the course of the disease [9,13,24]. There may be changes in results related to cognitive functions at different stages of epilepsy [25,26], so congenital anomalies in patients with epilepsy may show attention impairments in the speed of information processing. mental fatigue, in learning processes, executive functions, problem solving, short-term memory and working memory.

What is interesting has is the fact that these cognitive problems can in some cases be immediate, or appear later, they can be transient, constantly changing, or stable in nature. Another aspect that seems to have an impact on the identification of cognitive problems in children with epilepsy is attributed to the presence of a generalized crisis. Other studies suggest [27,28] that cognitive problems are more evident in children diagnosed with epilepsy with the presence of epileptic seizures compared to those with no crisis.

Referring to the results of our study and comparing them with other studies, we conclude that the changes in findings in terms of cognitive implications in the course of epilepsy can be attributed to the typology of the child with epilepsy, the type of epilepsy and comorbidity with neuropsychiatric disorders. In conclusion, if we need to determine who has the greatest impact on the development of cognitive problems in children with epilepsy, we can say that the fact that the child is diagnosed with this disease alone does not constitute conditions for having cognitive problems. But a combination of several factors increases the risk of having an epileptic child with a range of cognitive problems that can severely impair the progress of his or her development and quality of life in general. Children diagnosed with epilepsy who have received insufficient and inappropriate education, with frequent epileptic seizures, generalized type seizures, with longer duration of time, who have problems with depression, who have started treatment with antiepileptics very early and treated with more than one antiepileptic, summarize all those significant factors to create favorable conditions for the development of cognitive problems in them. Referring to the analysis of the evidences given by the studies on the relationship between epilepsy and cognitive problems, we can refer that the absence of a number of risk factors in children participating in the study has influenced cognitive difficulties at low levels.

A significant aspect related to the cognitive functions of children with epilepsy that has been examined through this study is the IQ, which is close to normal in most children, while for a small part it scores values above average and below the average. It results that IQ has no implications for participating children, developing conditions for a normal prognosis of the disease. In the group of children with under IQ, problems are foreseen in the general functioning of the children. These problems will complicate the child's normal progress in self-care, school well-being and social relationships. Referring to studies, findings have shown that there is a link between low IQ in children with epilepsy compared to children without epilepsy [15]. Referring to the findings investigating the link between IQ and epilepsy, it results that low intelligence is related to the type of deficit and the frequency of epileptic seizures [16]. So, children with a long history of epileptic seizures, with an active epilepsy are considered a vulnerable group to cognitive problems and low IQ. It also appears that the absence of a neurological deficit in children diagnosed with epilepsy is a key factor that determines whether or not intelligence is compromised. It results that the presence of a neurological deficit, whether mild, moderate or severe, has a significant impact on determining the child's IQ. The level of intelligence is lower in the presence of a severe neurological deficit compared to other groups. So, children with a severe neurological deficit tend to present compromised levels of intelligence. The negative effects of epilepsy on intellectual functions seem exaggerated in some cases [29]. Also based on results, the relationship between epilepsy and intelligence should be seen from the context of the impact of dysfunction in a wider range and under the influence of the severity of epileptic seizures based on a careful assessment, based on the extent of the abnormality and its location.

In conclusion, the diagnosis of epilepsy is not in it self a condition for an intelligence compromise in children, as referring to findings that in some children the level of intelligence was above average and this means that will need to look for the causes of the compromise

of the IQ in the correlation of other precipitating factors such as the presence of a moderate to severe neurological deficit, changes in the electrical activity of the brain recorded in the EEG, as well as variability in MRI response. These results direct us to the increased attention that should be attributed to neurological causes in terms of the level of severity of the disease and its interference in the cognitive field, intelligence.

In terms of the relationship between cognitive development and IQ in children with epilepsy, as well as other studies [19] we can imply that the high IQ present in children with epilepsy strongly facilitate the overall functioning of the child and successfully engage in a range of important interactions such as his/her commitment to schoolwork, independence and personal autonomy and social functioning. It seems that intelligence is a factor that positively affects how the child copes with emotions and balances affective states in different environments, in the way he\she successfully engages in social interactions with others significant to him\her in the family and at school. The severity of psychological symptoms associated with the levels of cognitive problems, intelligence in children with epilepsy will depend not on the presence of the diagnosis of epilepsy but on the association of the disease with a number of other conditions which are considered clinically significant. Referring to these conditions, we consider that the cause of obvious difficulties in terms of cognitive development is the presence of a low level of IQ, as well as the neurological deficit present throughout the course of epilepsy, structural changes and functional recorded on MRI. So, we can conclude that a higher probability of having a significant compromise in terms of overall functioning have those children diagnosed with epilepsy that have a comorbidity with the aforementioned elements. Their interaction with each other is the fulfillment of favorable conditions for the emergence of cognitive problems, which will have their impact in some areas of functioning such as school performance, independence and autonomy of the child and social interaction. A high IQ is likely to have a significant impact on facilitating the child's successful interaction process with his or her surrounding environment and in relation to his or her work tasks. High levels of intelligence favor the child to engage in a series of itineraries and manage to cope with them successfully. Thus, we refer to the progress in formative itineraries through which the child according to his\her achieved success will strengthen self-esteem, self-confidence and self-efficacy. Social interaction-related itineraries will help the child develop social competencies that allow him or her to communicate with others and learn how to perfect his or her behavior depending on personal needs. On the other hand, in low IQ in epileptic children, under the influence of factors such as increased occurrence of behavioral problems, the presence of a neurological deficit that accompanies epilepsy, as well as with MRI recording of obvious structural changes.

The connection between cognitive problems and the compromise of general IQ tends to show a more aggravated picture under the influence of externalizing and internalizing problems that disrupt the child's psychological balance, as well as neurological-related neurological damage such as the deficit type of epilepsy and structural changes in MRI and EEG electric wave recordings. We can conclude therefore that the interaction of psychological factors with biological ones develop the favorable ground for compromising the cognitive development of the child and interfering with the course of epilepsy.

Conclusion

The final conclusions guide us to the greater care that professionals need to show on improving continuous disease assessment and monitoring protocols to ensure that the intervention is tailored to the little patient's needs. Better communication is needed between different professionals who make the assessment and undertake treatments for certain aspects of the injury. Multidisciplinary teams are seen as a unique opportunity to create efficient improved care structures for children with epilepsy, who are active in the field of prevention, as well as for early diagnosis and intervention. In order for these mechanisms to work, it is necessary to properly qualify the health staff and educate the recipients of these services about the disease and risk factors. Getting proper health care according to the needs of the disease, age and other medical and psycho-social conditions is a fundamental right for every child with epilepsy, who should be oriented towards health care providers who understand the condition, use a technological infrastructure that facilitates long-term assessment of important aspects related to the disease and that are authorized to provide proper case management. This means in all cases the undertaking of an intervention based on clear clinical evidence which is continuously monitored throughout the course of treatment of

the disease. It is also important to consider that the success of our intervention in the child will depend on the predisposition of parents to cooperate, health structures that allow receiving the necessary services from each patient, as well as clear institutional and governmental policies to facilitate screening and continuous monitoring of the prognosis of epilepsy in children throughout their growth and development process.

Bibliography

1. Schaffer Y., *et al*. "Memory, Executive Skills, and Psychosocial Phenotype in Children with Pharmacoresponsive Epilepsy: Reactivity to Intervention". *Frontiers in Neurology* 8 (2017): 86.

2. Van de Ven M., *et al*. "Impact of maternal childhood trauma on child behavioral problems: The role of child frontal alpha asymmetry". *Developmental Psychobiology* 62.2 (2020): 154-169.

3. Berg AT., *et al*. "Age at onset of epilepsy, pharmacoresistance, and cognitive outcomes: a prospective cohort study". *Neurology* 79.13 (2012): 1384-1391.

4. Kim EH and Ko TS. "Cognitive impairment in childhood onset epilepsy: up-to-date information about its causes". *Korean Journal of Pediatrics* 59.4 (2016): 155-164.

5. Ravizza T., *et al*. "WONOEP appraisal: Biomarkers of epilepsy-associated comorbidities". *Epilepsia* 58.3 (2017): 331-342.

6. Ji T., *et al*. "Vagus nerve stimulation for pediatric patients with intractable epilepsy between 3 and 6 years of age: study protocol for a double-blind, randomized control trial". *Trials* 20.1 (2019): 44.

7. Nabbout R., *et al*. "Epilepsy in tuberous sclerosis complex: Findings from the TOSCA Study". *Epi*lepsia open 4.1 (2018): 73-84.

8. Perry W., *et al*. "Population Health Solutions for Assessing Cognitive Impairment in Geriatric Patients". *Archives of clinical neuropsychology: the official journal of the National Academy of Neuropsychologists* 33.6 (2018): 655-675.

9. Semple BD., *et al*. "Affective, neurocognitive and psychosocial disorders associated with traumatic brain injury and post-traumatic epilepsy". *Neurobiology of Disease* 123 (2019): 27-41.

10. Choi J., *et al*. "Serum α-synuclein and IL-1β are increased and correlated with measures of disease severity in children with epilepsy: potential prognostic biomarkers?" *BMC Neurology* 20.1 (2020): 85.

11. Boshuisen K., *et al*. "Cognitive consequences of early versus late antiepileptic drug withdrawal after pediatric epilepsy surgery, the TimeTo Stop (TTS) trial: study protocol for a randomized controlled trial". *Trials* 16 (2015): 482.

12. Brooks-Kayal AR., *et al*. "Issues related to symptomatic and disease-modifying treatments affecting cognitive and neuropsychiatric comorbidities of epilepsy". *Epilepsia* 54.4.4 (2013): 44-60.

13. Cano-López I., *et al*. "Typical asymmetry in the hemispheric activation during an fMRI verbal comprehension paradigm is related to better performance in verbal and non-verbal tasks in patients with epilepsy". *NeuroImage Clinical* 20 (2018): 742-752.

14. Wang L., *et al*. "Factors for cognitive impairment in adult epileptic patients". *Brain and Behavior* 10.1 (2020): e01475.

15. Walker NM., *et al*. "Is lower IQ in children with epilepsy due to lower parental IQ? A controlled comparison study". *Developmental Medicine and Child Neurology* 55.3 (2013): 278-282.

16. Martinos MM., *et al*. "Intelligence and memory outcomes within 10 years of childhood convulsive status epilepticus". *Epilepsy and Behavior* 95 (2019): 18-25.

17. Hermann B and Jacoby A. "The psychosocial impact of epilepsy in adults". *Epilepsy and Behavior* 15.1.1 (2009): S11-S16.

18. Liu J., *et al*. "Doublecortin-expressing cell types in temporal lobe epilepsy". *Acta Neuropathologica Communications* 6.1 (2018): 60.

19. Kerr M., *et al*. "Behavioral disorder in people with an intellectual disability and epilepsy: A report of the Intellectual Disability Task Force of the Neuropsychiatric Commission of ILAE". *Epilepsia open* 1.3-4 (2016): 102-111.

20. Ratcliffe C., *et al*. "Cognitive Function in Genetic Generalized Epilepsies: Insights From Neuropsychology and Neuroimaging". *Frontiers in Neurology* 11 (2020): 144.

21. Pike NA., *et al*. "Validity of the Montreal Cognitive Assessment Screener in Adolescents and Young Adults With and Without Congenital Heart Disease". *Nursing Research* 66.3 (2017): 222-230.

22. Xu SW., *et al*. "Cognitive decline and white matter changes in mesial temporal lobe epilepsy". *Medicine* 97.33 (2018): e11803.

23. Michaelis R., *et al*. "Psychological treatments for people with epilepsy". *The Cochrane Database of Systematic Reviews* 10.10 (2017): CD012081.

24. Tavakol S., *et al*. "Neuroimaging and connectomics of drug-resistant epilepsy at multiple scales: From focal lesions to macroscale networks". *Epilepsia* 60.4 (2019): 593-604.

25. Jacobs CS., *et al*. "Non-invasive Cognitive Enhancement in Epilepsy". *Frontiers in Neurology* 10 (2019): 167.

26. Veluri N. "A Case of Cognitive Decline Resulting from Aging, Temporal Lobe Epilepsy, and Environmental Factors". *Case Reports in Psychiatry* (2019): 9385031.

27. Packer R., *et al*. "Cognitive dysfunction in naturally occurring canine idiopathic epilepsy". *PloS one* 13.2 (2018): e0192182.

28. Saletti PG., *et al*. "In search of antiepileptogenic treatments for post-traumatic epilepsy". *Neurobiology of Disease* 123 (2019): 86-99.

29. Paldino MJ., *et al*. "Normalization enhances brain network features that predict individual intelligence in children with epilepsy". *PloS one* 14.3 (2019): e0212901.

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