Research Article

Assessment of Serum Levels of Selenium and Zinc in Children with Epilepsy

Magdy M. Kamel, Doaa M. Mahrous and Esraa Salama M.
Department of Pediatrics, El-Minia Faculty of Medicine

Abstract
Introduction: Epilepsy is a disease of the central nervous system in which electrical signals of the brain are interrupted. These disruptions cause temporary communication problems between nerve cells, leading to seizures by the neurobiologic , cognitive, psychological, and social consequences of this condition. Selenium (Se) and Zinc (Zn) are trace elements that are involved in metabolism of oxygen radicals, their deficiency play role in epilepsy. **Patients and methods:** 80 children were included for assessment of serum levels of selenium and zinc. 80 children divided into 60 epileptic children (subdivided into 30 children with controlled epilepsy and 30 children with uncontrolled epilepsy) and 20 children as a control group. **Results:** There were significant decrease in serum levels of selenium and zinc in epileptic children in comparison with control group. there was no significant correlation between serum level of selenium with different variables including age, EEG finding ,number of attacks ,family history and treatment .There were significant decrease in serum level of zinc more in males than females epileptic patients with controlled epilepsy. **Conclusion:** Low serum levels of both selenium and zinc were found in epileptic children. antiepileptic drugs (AEDs) may be risk factors for decreased minerals in these children and need more study.
Key words: Epilepsy, Selenium , Zinc and AEDs

Introduction
Epilepsy is a chronic disorder, or group of chronic disorders, in which the indispensable feature is recurrence of seizures that are typically unprovoked and usually unpredictable. The most common type of epilepsy, which affects 6 out of 10 people with the disorder, is called idiopathic epilepsy and has no identifiable cause[(1)].

Selenium (Se) and Zinc (Zn) are trace elements that are involved in metabolism of oxygen radicals. For example, Se is involved in the reduction of peroxidase by participating in the structure of glutathione peroxidase GPx, which is very important antioxidant enzyme.[(2)]
Low levels of Se and GPx have been found in patients with epilepsy [(3).]

Patients and Methods
This study was conducted in outpatient pediatric neurology clinic at Minia university hospitals for pediatrics, gynecology and obstetrics in the period from January 2018 to …August 2018.

This study included 2 groups:
- **Group I:** Sixty patients were included. They were subdivided into two groups:

Group Ia: included 30 children with controlled epilepsy and were following up in the outpatient pediatric neurology clinic in the hospital and **Group Ib:** Included 30 children with uncontr-olled epilepsy, They were recruited from the neurology unit in pediatric department in the hospital.
- Group II: Twenty healthy children were included in this study as controls, they were age and sex-matched to the cases group.

All children were subjected to the Complete history taking: With emphasis on attacks of epilepsy, age of onset, frequency of attacks and family history, type of treatment of antiepileptic drug and duration of treatment, Complete

physical examination and neurological examination.

Also Laboratory investigations which included serum levels of selenium and zinc.

Laboratory methods:
Inclusion criteria: Age from 6months to 12 years, With diagnosis of epilepsy according to examination and EEG study and Approval to participate in the study.

Exclusion criteria: Patients who did not fulfill all inclusion criteria or refused to participate were excluded.
Samples taken to asses serum levels of selenium and zinc with Direct colorimetric test without deproteinization of the sample to obtain descriptive statistics and analytical statistics.
For all tests a probability (p) was considered:

- Non significant if > 0.05.
- Significant if < 0.05.
- Highly significant if < 0.001

Results

Table (1): Demographic data of the studied groups:

		Group I		Group II N=20	P-value
		Group Ia N=30	Group Ib N=30		
Age	**In month**	61.6±44.1	38.6±40.5	40.6±29.9	0.054
Sex	**Males** **Females**	15(50%) 15(50%)	17(56.7%) 13(43.3%)	15 (%٧٥) 5 (25%)	0.244
Family history	**Yes** **No**	1(3.3%) 29(96.7%)	2(6.7%) 28(93.3%)	-	0.641
Consanguinity	**Yes** **No**	15(50%) 15(50%)	13(43.3%) 17(56.7%)	-	0.611

Table (2): Comparison of selenium and zinc levels among cases and controls:

	GROUP I N=60	GROUP II N=20	P-value
	Range Mean ±SD	Range Mean ±SD	
Selenium (ng/ml)	25-96 56.1±18.1	65-101 83.6±10.3	<0.001*
Zinc (µg/dl)	35-106 68.2±16.2	68-112 90.4±15.1	<0.001*

Table (3): Comparison between controlled and uncontrolled cases with the control group as regard serum levels of selenium and zinc:

	GROUP IA N= 30	GROUP IB N=30	Group II N=20	P-value
	Range Mean ± SD	Range Mean ± SD	Range Mean ± SD	
Selenium (ng/ml)	25-96 56.7±17.4	28-92 55.5±19.1	65-101 83.6±10.3	<0.001* P1: 0.779 P2:<0.001* P3:<0.001*
Zinc (µg/dl)	40-106 71.1±16.5	35-105 65.2±15.6	68-112 90.4±15.1	<0.001 P1: 0.145 P2: <0.001* P3: <0.001*

Table (4): Correlations between serum level of selenium and different variables:

	All cases N=60		Controlled epilepsy N= 30		Uncontrolled epilepsy N=30		Control group N=20	
	R	P	R	P	R	P	R	P
Age	-0.043	0.741	0.134	0.427	-0.108	0.563	0.147	0.536
Positive EEG findings	0.016	0.899	0.051	0.787	-	-	-	-
Number of Attack	0.053	0.684	0.054	0.773	0.041	0.828	-	-
Positive Family history	-0.022	0.868	0.103	0.582	-0.104	0.579	-	-
Mono-Therapy	0.034	0.795	0.245	0.184	-0.147	0.431	-	-

Table (5): Correlations between serum level of zinc and different variables:

	All cases N=60		Controlled epilepsy N= 30		Uncontrolled epilepsy N=30		Control group N=20	
	R	P	R	P	R	P	R	P
Age	0.112	0.387	0.187	0.315	-0.063	0.737	0.124	0.603
Male Sex	-0.324	0.01*	-0.362	0.046*	-0.278	0.130	0.030	0.900
Positive EEG	0.062	0.633	0.300	0.101	-	-	-	-
Number of Attack	0.065	0.617	0.074	0.694	0.033	0.859	-	-
Positive FH	0.002	0.990	-0.103	0.582	0.092	0.624	-	-
Mono-Therapy	-0.111	0.389	-0.307	0.093	0.000	1	-	-

Table (6) serum level of Zinc among males and females:

	Males	Females	P-value
All cases	64.3±17.1	72.9±13.9	0.034*
Controlled epilepsy	66.5±17.4	76.1±14.3	0.048*

Discussion

Epilepsy is a disease of the central nervous system in which electrical signals of the brain are interrupted. These disruptions cause temporary communication problems between nerve cells, leading to seizures by the neurobiologic, cognitive, psychological, and social consequences of this condition[4].

There have been numerous reports on the association of trace elements and epilepsy .the cascade of neurotoxic events that lead to epileptic seizures is highly complex , but the main event involves the accumulation of free oxygen radicals[5].

Low levels of Se and GPx have been found in patients with epilepsy[3, 6].

Considering the fact that selenium is a cofactor for some enzymes with antioxidant, Selenium depletion in the brain amongst patients with epilepsy may constitute an important triggering factor for the origin of intractable seizures and subsequent neuronal damage[7].
Zinc homeostasis in the brain is closely related to neuronal activity. It has been reported that susceptibility to epileptic seizures, which may decrease vesicular zinc, is also enhanced by zinc deficiency[8].

In this study, a significant decrease in both serum level of Selenium (Se) and Zinc (Zn) found in both controlled, uncontrolled epileptic patients compared to control group.

The decrease in serum level of Selenium in the current study agreed with Deniz Yılmaz and Oya Balcı who found that serum level of selenium decreased in resistant epileptic group[9].
The significantly decreased levels of Se in our study agreed also with the results of Ashrafi et al., who also found low levels of Se in patients with intractable epilepsy[3].

The results of the current study seemed to be positively correlated with another results regarding low Se levels in patients with mostly Idiopathic intractable epilepsy (IIE)[10].

And this is also in concordance with Siamak SHIVA et al., who found a significant lower mean of serum selenium in patients with epilepsy compared to that of healthy control group[11].
In contrast to our results, Verroti et al found no difference in serum levels of selenium between controls and epileptics[12].

In the current study, there was significant decrease in serum level of Zinc (Zn) in group I which included controlled and uncontrolled epileptic children, this is in concordance with Seven et al, who found that the patients with idiopathic intractable epilepsy had significantly decreased levels of serum zinc compared to those of the control group[13].

Imran Gattoo et al., also found that there was decrease in serum Zn concentration in epileptic patients in comparison with the control group[14].
In another study done by Osama N. Salah et al., patients with idiopathic intractable epilepsy had significantly decreased levels of serum zinc in comparison with healthy children[15].

Contradictory to our results, some reported that variations in serum Zn concentrations are a normal physiological process and are unlikely to be related to anticonvulsant drugs or epilepsy, they found that serum Zn concentration is irrelevant with the incidence of epilepsy and seizure[16].
Huseyin Per et al., found that there was increased levels of Zn concentration in all patients with epilepsy [17].

Also Verroti et al., found no difference in serum levels of zinc between controls and epileptics[12].
In a study done by Sadia Syeda Khadria and Jaidev M. D.,Vidya, they found that serum zinc levels were not decreased in patients with epilepsy as compared to healthy control[18].

Sriram Bonu et al found that was no changes in serum or plasma Zn concentration in epileptic patients as compared to control group, as described by some authers[19].

In the current study, we noticed that was significant decrease in serum level of zinc more in males than females epileptic patients with controlled epilepsy (group IA), this result disagree with Sreenivasa B et al., who found that serum zinc levels did not show any significant correlation with age of onset, gender, family history and nutritional status[20].
In our study there were decrease in serum levels of selenium and zinc in patients treated with valporic acid (VPA).

This agree with Suzuki et.al who showed that serum Zn levels decreased in epileptic patients who were receiving combinated VPA and other AED treatments[22].

On another hand some authors found normal serum Zn in epileptic patients after a 1-year treatment with sodium valproate and carbamazepine, there were no changes in serum or plasma Zn concentration in epileptic patients as compared to control group, as described by some authors[21].

Khaled Saad et al., 2014 suggested that antiepileptic therapy was the main cause of the decreased Se levels, children with epilepsy have also been found to suffer from relative malnutrition which adds to the severity of the intractability of their seizures[8].

Conclusions and Recommendations

In conclusion, Low serum levels of both selenium and zinc were found in epileptic children Antiepileptic drugs (AEDs) may be risk factors for decreased minerals in these children and need more study.

Recommendations

- Serum levels of selenium and zinc should be monitored in epileptic children
- Supplementation of Selenium and Zinc for epileptic children can be studied
- antiepileptic drugs play role in decreased serum levels of selenium and zinc ,so they should be monitored and supplementation start if there are any decrease.

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