

Serum Malondialdehyde and Vitamin C in Children with Epilepsy

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ABSTRACT

Background: Epilepsy is one of the most common neurological disorders. The prevalence of active epilepsy was estimated to be 6.38 per 1000 persons. Serum malondialdehyde (MDA) is used as a marker to investigate the oxidative damage of lipids in many degenerative human diseases. Vitamin C is important for the proper functioning of the central nervous system.

Objective: To evaluate the association of serum MDA and vitamin C with epilepsy in children.

Methods: This case-control study was carried out in the Pediatric Department at Zagazig University Hospitals during the period from December 2019 to July 2020. This study included 46 children who were divided into 2 groups: Cases group: which included 23 epileptic children. Control group: which included 23 healthy children with age and sex-matched to cases. All the participants were subjected to measuring serum malondialdehyde MDA and Vitamin C.

Results: This study showed that there was a statistically significant increase in serum malondialdehyde (MDA) among the case group than the control group. Also, there was a statistically significant decrease in serum Vitamin C among the case group than the control group.

Conclusion: This study has correlated the increase of lipid peroxidation and defective antioxidant defense and the pathogenesis of epilepsy and we found a significantly elevated level of MDA and a depleted level of vitamin C in epileptic patients than in the healthy control subjects

Keywords: Serum Malondialdehyde, Vitamin C, Epilepsy.

INTRODUCTION

Epilepsy is considered one of the most common neurological disorders. The prevalence of active epilepsy was estimated to be 6.38 per 1000 persons ⁽¹⁾. It is associated with heterogeneous nature that affecting 50 million people worldwide, with more than 85% living in the developing world, and it begins in childhood in more than half of the cases. An estimated 4.7 million people with epilepsy live in the Eastern Mediterranean Region ⁽²⁾. The prevalence of epilepsy in Egypt is not accurately determined, although some studies reported that the lifetime prevalence rate of epilepsy is 12.67/1000 ⁽³⁾.

Serum malondialdehyde (MDA) is an endogenous genotoxic product, generated by oxidation of arachidonic acid and larger polyunsaturated fatty acids (PUFAs). It is used as a marker to investigate the oxidative damage of lipids in many degenerative human diseases ⁽⁴⁾. Vitamin C is important for the proper functioning of the central nervous system. Reduction of optimum concentration causes structural and functional damage to the cells and imbalance in the neurotransmission system. Microminerals and trace elements act as crucial components for the development of immunity and provide antioxidant defense in the human body ⁽⁵⁾.

The objective of this study was to evaluate the association of serum MDA and vitamin C with epilepsy in children.

PATIENTS AND METHODS

This case-control study was carried out in the Pediatric Department at Zagazig University Hospitals during the period from December 2019 to July 2020.

It included 46 children who were divided into 2 groups:

Cases group: which included 23 epileptic children.

Control group: which included 23 healthy children with age and sex-matched to cases.

Inclusion criteria:

1. All patients who are newly diagnosed with epilepsy, having abnormal EEG, and have been experiencing at least one seizure in the past 6 months.
2. Both sexes are included.
3. Patient with no previous history of antiepileptic and antioxidant drug administration.
4. Age (1-12 years).

Exclusion criteria:

1. Absence of informed consent.
2. Age group out of range (1- 12 years).
3. Patient with a previous history of antiepileptic and antioxidant drug administration.
4. Patient who had a severe general medical condition (diabetes mellitus, renal, cardiovascular, liver disease, endocrine disorder).



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All the participating patients were subjected to the following:

- Full history taking: (age, gender, and duration as well as the severity of the disease) from the medical file of the patients.
- Clinical Examination: (weight, height, body mass index (BMI), blood pressure.) with special stress on the following: duration of epilepsy.
- Systemic and local examination.
- Laboratory Investigations Including:
 - Serum malondialdehyde MDA.
 - Serum Vitamin C.

Ethical Consideration:

An approval of the study was obtained from Zagazig University academic and ethical committee. Informed consent was taken from the parents of the children to participate in the study. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical Analysis:

Data analysis was performed using the software SPSS (Statistical Package for the Social Sciences) version 24. Quantitative variables were described using

their means and standard deviations. Categorical variables were described using their absolute frequencies and were compared using the Chi-square test and Fisher exact test when appropriate. Kolmogorov-Smirnov (distribution-type) tests were used to verify assumptions for use in parametric tests. To compare continuous quantitative data of two groups, the Mann-Whitney test (for non-normally distributed data) and the independent-sample t-test (for normally distributed data) were used. The level of statistical significance was set at 5% (P<0.05).

RESULTS

There was no statistically significant difference between case and control groups regarding Age (year), sex, and residence (Table 1).

There was a statistically significant difference between case and control groups regarding family history of epilepsy. While there was no statistically significant difference between case and control groups regarding consanguinity history (Table 2).

There was no statistically significant difference between case and control groups regarding weight, height, and BMI as well as SBP and DBP. There was a statistically significant increase in serum MDA among the case group than the control group. There was a statistically significant decrease in serum Vitamin C among the case group than the control group (Table 3).

Table (1): Comparison between the case and control groups regarding demographic data.

			Cases group (No.= 23)	Control group (No.= 23)	P-value
Age(year)	Range		1.3 - 10.5	2.0 - 12.0	0.959
	Mean ± SD		5.74± 3.02	5.69 ± 3.19	
Sex	Female	No.	11	6	0.127
		%	47.8%	26.1%	
	Male	No.	12	17	
		%	52.2%	73.9%	
Residence	Rural	No.	17	16	0.743
		%	73.9%	69.5%	
	Urban	No.	6	7	
		%	26.1%	30.5%	

X² test: Chi-square test. t-test: Student test
P<0.05 is statistically significant (S)

P-value >0.05 is non-statistically significant (N-S).

Table (2): Comparison between case and control groups regarding family and consanguinity history

			Cases group (No.= 23)	Control group (No.= 23)	P-value
Family history	Positive	No.	13	1	0.000
		%	56.5%	4.3%	
	Negative	No.	10	22	
		%	43.5%	95.7%	
Consanguinity history	Positive	No.	10	9	0.765
		%	43.5%	39.1%	
	Negative	No.	13	14	
		%	56.5%	60.9%	

X² test: Chi-square test., P-value >0.05 is non-statistically significant (N-S). P<0.05 is statistically significant (S)

Table (3): Comparison between case and control groups regarding anthropometric measurements, SBP & DBP, serum malondialdehyde, and serum Vitamin C.

		Cases group (No.= 23)	Control group (No.= 23)	P-value
Weight (kg)	Mean±SD	22.64 ± 8.46	20.94 ± 8.39	0.495
Height (cm)	Mean±SD	110.96±23.48	110.24±21.94	0.915
BMI (kg/m ²)	Mean±SD	18.52 ± 4.54	16.72 ± 1.92	0.087
SBP	Mean±SD	91.96 ± 9.97	95.87 ± 7.02	0.131
DBP	Mean±SD	65.87 ± 7.93	69.78 ± 6.30	0.071
MDA (µmol/mL)	Mean ± SD	0.36 ± 0.07	0.17 ± 0.03	0.000
Vitamin C (µmol/mL)	Mean ± SD	0.53 ± 0.13	1.13 ± 0.39	0.000

t-test: Student test P-value >0.05 is non-statistically significant (N-S).

DISCUSSION

This case-control study was carried out in the Pediatric Department at Zagazig University Hospitals. It included 46 children who were divided into 2 groups: Case group: which included 23 epileptic children and the control group: which included 23 healthy children who were age and sex-matched to cases.

This study showed that there was no statistically significant difference between the two groups regarding age, sex, and residence.

These findings are consistent with **Fiest et al.** (6) who found that the prevalence of epilepsy did not differ by age and sex.

In the present work, there was no statistically significant difference between the case and control groups regarding weight, height, and BMI.

Our results are in agreement with **Huffman and Kossoff** (7) who found that no data are establishing the relationship between seizure and obesity in comorbid conditions.

In our study, we found that there was no statistically significant difference between the case and control groups regarding SBP and DBP.

This is in disagreement with **Isojärvi et al.** (8) who found that, the co-relationship of epilepsy and blood pressure is complex and controversial. The treatment of epilepsy may play a vital role in increasing blood pressure because antiepileptic medication, especially carbamazepine increases high-density lipoprotein cholesterol level, which leads to hypertension.

This study showed that there was a statistically significant increase in serum malondialdehyde (MDA) among the case group than the control group.

Current results are consistent with **Zhang et al.** (9) and **Bindu et al.** (10) who reported an increased MDA level in epileptic patients compared to that in the control group. Increased malondialdehyde (MDA) level in epileptic patients may be due to changes in the antioxidant defense mechanisms and the resulting lipid peroxidation are involved in the pathogenesis of epilepsy (11).

In our study, there was a statistically significant decrease in serum Vitamin C among the cases than the

control group. This is similar to the study conducted by **Das et al.** (11) who found a lower level of vitamin C in the patient group (18.31 ± 0.84 µmol/L) compared with the controls (29.72 ± 1.06 µmol/L).

CONCLUSION

This study has correlated increase of lipid peroxidation and defective antioxidant defense to the pathogenesis of epilepsy and we found a significantly elevated level of MDA and a depleted level of vitamin C in epileptic patients than in the healthy control subjects.

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