ORIGINAL RESEARCH

Assessment of Level of Free Radical and Super Oxide Dismutase Activity in Treating Epilepsy Patient with Associated Depression

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ABSTRACT

Introduction: Malondialdehyde (MDA) is the end product of lipid peroxidation and is the finished result of lipid peroxidation and is the fundamental optional oxidation result of polyunsaturated unsaturated fats. The present study was planned for assessment of levels of free radicals and superoxide dismutase activity in treating epilepsy patients with associated depression.

Material and methods: For the study, we selected patients diagnosed with epilepsy from 1 year or more that reported to the department during study period. Newly diagnosed cases of epilepsy were excluded from the study. For the study, we selected 165 patients and divided them into 6 groups based on their diagnosis. All the results were compiled and assessed by SPSS software.

Results: The lowest value of SOD was found in Group III (presence of epilepsy with psychosis). The value of superoxide dismutase (SOD) was lower in patients of psychosis but further lowers down when it is associated with epilepsy. The highest value of MDA was observed in group II that is patient of epilepsy with depression, followed by group III, group IV, group V, group I for males and females patients.

Conclusion: From the results of the study, this can be concluded that antioxidant status of the epileptic patients may be disturbed which suggests that antioxidant treatment should also be added in the treatment.

Keywords: Depression, Epilepsy, Psychosis, Superoxide

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INTRODUCTION

Epilepsy is a neurological disease, defined as intermittent, stereotyped, disturbance of consciousness, behavior, emotion, motor function, or sensation. Epileptic seizures are believed to result from cortical neuronal discharge and thus epilepsy can be defined as the body's state associated with spontaneous (usually) seizures.[1] Repeating seizures originate from hyper excitation of certain group of neurons and lead to different transient clinical signs and laboratory findings. The nervous system for a number of biochemical, physiological and anatomical reason is more vulnerable to reactive oxygen species (ROS) in addition to the other organs of the body.[2] Disrupted tissues undergo lipid peroxidation more quickly than healthy ones. The potential toxicity of reactive oxygen species is counteracted by a large number of cytoprotective enzymes and antioxidants.[3,4] Treatment with antiepileptic medications might have the capacity to apply ace oxidant or potentially cancer prevention agent impact and expanding the cell reinforcement movement in patients with treatment, almost up to the ordinary range. Malondialdehyde (MDA) is a mutagenic, cancer-causing, and genotoxic aggravate that is the finished result of lipid peroxidation and is the fundamental optional oxidation result of polyunsaturated unsaturated fats. It is realized that the levels of this compound increment in a few sicknesses that are identified with free-radical harm. MDA is the most generally utilized marker of oxidative harm.[5-8] So, the present study was planned for assessment of levels of free radicals and superoxide dismutase activity in treating epilepsy patients with associated depression.

MATERIALS AND METHODS

The study was conducted in the Department of General Medicine of the medical institution. The ethical approval for the study was obtained from the ethical committee of the institute. Inclusion criteria for the present study included patients with minimum of one year of history of epilepsy. Newly diagnosed cases of epilepsy were excluded from the study. An informed consent was signed from each participant after informing them about the procedure of the study. For the study, we selected 165 patients and divided them into 6 groups based on their diagnosis. The criteria for grouping are given below:

Group I: Patients diagnosed with generalized epilepsy
Group II: Patients diagnosed with epilepsy with depression
Group III: Patients diagnosed with epilepsy with psychosis

Group IV: Patients diagnosed with idiopathic epilepsy
Group V: Patients diagnosed with psychosis without epilepsy
Control group: Normal Healthy Individuals

For the measurement of SOD levels in platelets and MDA levels, samples were collected from each patient and sent to laboratory for evaluation. Homogenization of the samples was done in Tris–HCl 10mM (pH 7.5) and centrifuged at 10,000 rpm for 10 min. Shimadzu UV-2100 spectrophotometer was used at 37◦C for the determination of SOD activities in blood samples. The generation of superoxide anion (O^{2-}) was done using xanthine/xanthine oxidase system. The generated anion produced the reduction of cytochrome C. The reduction of cytochrome C is inhibited in the in the sample due to presence of SOD in the sample as SOD removes the superoxide anion. The monitoring of this cytochrome C is done at 550 nm. On the basis of presence of proteins content level in the samples, correction of all the results was done. Measuring of proteins was done using Biorad Protein Assay. Analysis of Malondialdehyde (MDA), a marker of lipid peroxidation was done using colorimetric assay kit following the manufacturer's instructions. The mean levels of the SOD and MDA were calculated and results were assessed.

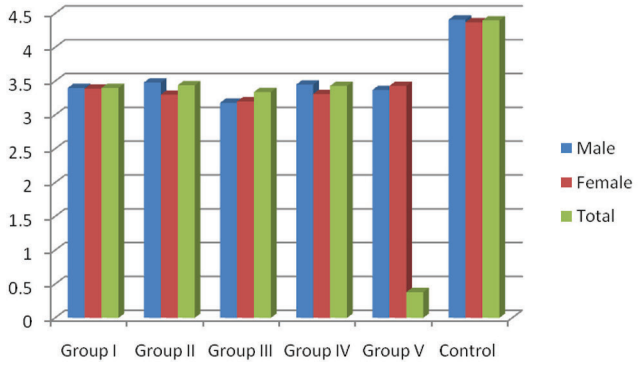

Figure-1: Comparison of mean values of of SOD (Superoxide Dismutase) in platelets in Different Groups of patients according to Sex

STATISTICAL ANALYSIS

Statistical analysis of the data was done using SPSS software for windows. Student's t-test and Chi-square test were used to check the significance of the data. Statistical significance was predetermined at P value less than 0.05.

RESULTS

The total no. of patients selected for the study was 165. They were grouped into 6 groups (Group I, Group II, Group III, Group IV, Group V and control group) based on their diagnosis. The number of patients in Group I were 59, in Group II were 27, in Group III were 16, in Group IV were 18, in Group V were 16 and in control group were 29. Table 1 shows the average levels of SOD in platelets in different group of patients according to their sex. It has been observed that lowest value of SOD was found in Group III (presence of epilepsy with psychosis) followed by Group V (psychosis without epilepsy). The value of SOD was lower in patients of psychosis but further lowers down when it is associated with epilepsy. On statistically analysis, it was found that lower value of SOD in group I, II, III, IV, V differs significantly from average control values. The difference of average values of Group I, II, III, IV was statistically significant ($p<0.001$) from the control group (figure-1).

Table 2 shows average value of MDA in the patients in different groups of patients according to their sex. It has been observed that highest value of MDA was observed in group II that is patient of epilepsy with depression, followed by group III, group IV, group V, group I for males and females patients (figure 2).

DISCUSSION

Epilepsy is a serious neurological disorder affecting more than 50 million people worldwide.[9] Oxidative stress and mitochondrial dysfunction are increasingly being recognized

Groups			Group I	Group II	Group III	Group IV	Group V	Control
Sex	Male	No.	59	27	16	18	16	29
		Mean	3.40	3.48	3.18	3.45	3.37	4.41
		SD	0.42	0.31	0.16	0.46	0.52	0.23
		T	11.878	12.807	19.00	9.524	9.306	
		P	<0.001	<0.001	<0.001	<0.001	<0.001	
	Female	No.	26	9	14	9	6	21
		Mean	3.39	3.30	3.20	3.31	3.43	4.37
		SD	0.49	0.39	0.32	0.54	0.32	0.24
		T	8.377	10.520	12.362	7.542	7.871	
		P	<0.001	<0.001	<0.001	<0.001	<0.001	
	Total	No.	85	36	30	27	22	50
		Mean	3.40	3.44	3.34	3.43	0.38	4.398
		SD	0.42	0.47	0.48	0.41	0.47	0.236
		T	15.367	12.361	13.771	11.925	12.325	
		P	<0.001	<0.001	<0.001	<0.001	<0.001	

Table-1: Showing average levels of SOD (Superoxide Dismutase) in platelets in Different Groups of patients according to Sex

Groups			Group I	Group II	Group III	Group IV	Group V	Control
Sex	Male	No.	59	27	16	18	16	29
		Mean	2.33	2.43	2.40	2.35	2.33	0.50
		SD	0.30	0.22	0.23	0.23	0.22	0.16
		T	30.769	37.334	32.554	32.553	32.08	
		P	<0.001	<0.001	<0.001	<0.001	<0.001	
	Female	No.	26	9	14	9	6	21
		Mean	2.32	2.35	2.38	2.32	2.31	0.460
		SD	0.22	0.18	0.21	0.24	0.20	0.111
		T	35.293	35.459	35.403	29.468	30.056	
		P	<0.001	<0.001	<0.001	<0.001	<0.001	
	Total	No.	85	36	30	27	22	50
		Mean	2.32	2.41	2.39	2.34	2.32	0.484
		SD	0.27	0.21	0.22	0.23	0.21	0.145
		T	44.457	51.17	47.435	44.239	43.294	
		P	<0.001	<0.001	<0.001	<0.001	<0.001	

Table-2: Showing average levels of MDA in platelets of different groups of patients according to sex

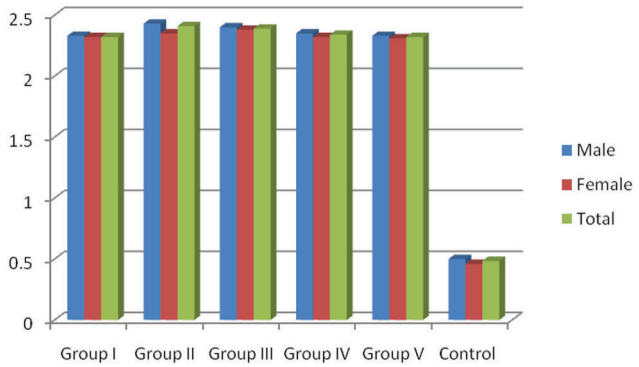

Figure-2: Comparison of MDA in platelets of different groups of patients according to sex

as having important roles in the pathophysiology of neurological diseases such as epilepsy. The three most important antioxidant enzymes are superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPx). Vitamin E appears to be the first line of defense against peroxidation of the polyunsaturated fatty acids (PUFAs) contained in cellular and subcellular membrane phospholipids. The tocopherols break free radical chain reactions as a result of their ability to transfer phenolic hydrogens to the peroxyl free radicals of peroxidized PUFAs.[11] During recent years, a number of genomic and proteomic studies have strongly suggested a key role of oxidative/antioxidative systems in the pathogenesis of epilepsy.[12]

In the present study, we observed that group II patients diagnosed with epilepsy with depression had the highest value of MDA in contrast to other groups. Dönmezdil N et al by drawing on a gathering of patients with epilepsy who were getting no treatment, attempted to assess regardless of whether an expansion in oxidative markers is connected straightforwardly with the turmoil, free of epileptic medicaments. Thirty individuals healthy and 30 recently determined to have epilepsy and who got wandering treatment in the polyclinic of the Neurology Department partook in the review. The tests identifying with serum malondialdehyde (MDA) levels and paraoxonase 1 (PON1) movement were done in the biochemistry research facility. Despite the fact that the levels of MDA in the patient gathering (14.34±3.59 nmol/mL) were observed to be high contrasted with those of the control gathering, which comprised of individuals healthy (13.53±3.56 nmol/mL), there was no factually huge distinction. PON1 movement in the serum taken from individuals in the patient gathering (0.65±0.17) was lower in contrast with that seen in the serum of the control gathering (0.71±0.17 U/L). In any case, it was not all that low as to have criticalness from a factual perspective. It was inferred that such an abnormal state of oxidative parameters ought to have been identified with the sickness and that factually noteworthy discoveries that risen in some different reviews could have been identified with an antiepileptic treatment.[13] Eldin EN et al concentrated the impact of seizure recurrence on free radical era and cell reinforcements levels in epileptic patients and the relationship between's their esteems and the level of antiepileptic medications level in serum with the movement or the control of seizure which might be a prognostic incentive for seizure. This review was done on 15 healthy controls (GI) and 60 epileptic patients were they partitioned into 2 primary gatherings; 30 controlled epileptic patient treated with antiepileptic drugs where they separated into 2 sub-bunches as per the recurrence of seizure; 15 epileptic patients were free of seizure for over one year (GIIA) and 15 epileptic patients were free of seizure for short of what one year and over six months (GIIB). 30 uncontrolled epileptic patients treated with antiepileptic drugs with uncontrolled seizure, this gathering was separated into 2 subgroups as per the recurrence of seizure; 15 epileptic patients had a recurrence of seizure under 4 times each month (GIIIA) and 15 epileptic patients had a recurrence of seizure more than 4 times each month (GIIIB). They found that urinary MDA/Creatinine proportion and Nitric Oxide (NO) were fundamentally expanded in GIIB, GIIIA and GIIIB contrasted with the control gather where Vitamin A was especially diminished in GIIIB gathering. Likewise vitamin E was essentially diminished in GIIIA

and GIIIB gatherings. At the review, the serum antiepileptic drugs and other researched parameters it was discovered that no factual relationship show up in all studed gatherings. NO had a critical negative connection with serum vitamin E in gathering GIIA and GIIB. Additionally, serum NO had negative relationship with vitamin An in gathering GIIIA. Then again serum NO had positive connection with urinary MDA/ Creatinine proportion. The awkwardness between free radical era and cancer prevention agent framework might be a reason for seizure assault.[14]

In the present study, we observed that Group III patients that were diagnosed with epilepsy with psychosis had the lowest value of SOD as compared to other groups. Followed by group III were group V patients having psychosis without epilepsy. The value of SOD was lower in patients of psychosis but further lowers down when it is associated with epilepsy. The difference of average values of Group I, II, III, IV was statistically significant ($p<0.001$) from the control group. Martinc B et al led a survey that confirmed an affiliation between epilepsy and expanded lipid peroxidation. Also, it might have been additionally demonstrated that a portion of the antiepileptic medications Might possibly a chance to be answerable for also expanded lipid peroxidation. In this way, it is sensible to recommend that amid the epileptic procedure neuroprotective treatment with cell reinforcements could prompt less disjoin auxiliary harms, lessened epileptogenesis and milder psychological crumbling. To assess this theory ponders exploring the neuroprotective remedial capability of different cancer prevention agents in cells, creature seizure models and patients with epilepsy have been looked into. Various advantageous impacts of cell reinforcements on oxidative anxiety markers and now and again likewise neuroprotective impacts were seen in creature seizure models. As an add-on therapy, very little practical use of these antioxidants has been done in epilepsy patient's inspite of coming of such good and encouraging results. Therefore, it is warranted that future studies should direct on more positive findings in various animal models for the assessment of effect of these antioxidants in epilepsy patients.[15] Bellissimo MI et al utilizing the epilepsy display gotten by systemic organization of pilocarpine (PILO) in rats, researched the superoxide dismutase (SOD) and glutathione peroxidase (GPx) exercises and additionally the hydroperoxide (HPx) fixation in the hippocampus of rats amid status epilepticus (SE), noiseless and incessant periods. The protein exercises and also the hydroperoxide fixation were measured utilizing spectrophotometric strategies and the outcomes contrasted with qualities gotten from saline-treated creatures. The superoxide dismutase movement diminished after durable SE period and amid the unending stage. Moreover, hydroperoxide levels expanded in same periods though the glutathione peroxidase movement expanded just in the hippocampus of animal models within 60 minutes of status epilepticus. From the results, the authors concluded that direct evidence exists between the lipid peroxidation during seizure activity which could directly or indirectly result in neuronal damage of rat's hippocampus.[16]

CONCLUSION

From the results of the study, this can be concluded that antioxidant status of the epileptic patients may be disturbed which suggests that antioxidant treatment should also be added in the treatment.

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