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Association of Antioxidant to the Genesis of Psychiatric Disorder

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ABSTRACT

Mental disorders were associated with a wide range of chronic illnesses, disability, and even mortality, particularly among elderly people. Depression will be the second cause of disease. Anxiety is an emotional state of antipathy in which the sense of fear is disproportionate to the magnitude of the risk. Enzymatic antioxidants like SOD, GPx, and non-enzymatic antioxidants such as vitamin C, E act as free scavengers, thereby reducing oxidative stress and resulting in cell injury. Thus, we aimed to study SOD, GPx, Vitamin C, and Vitamin E, 1. To study levels of SOD, GPx, Vitamin C, and Vitamin E in psychiatric disorders.2. To study the levels of Vit-C and E before and after vitamin supplementations. To correlate the levels of SOD, GPx, Vitamin C, and Vitamin E between psychiatric patients and healthy controls (age-matched) attending AVBRH Wardha and SMHRC Nagpur. This cross-sectional examination was completed on 50 psychiatric patients and 50 healthy controls and the levels of SOD, GPx, Vitamin C, and Vitamin E are measured before and after giving supplements. In Psychiatric patients, Superoxide dismutase (SOD) levels were 135.26±24.68, Glutathione Peroxidase levels were 1.591±3.35, Vitamin C levels were 0.32±0.11 and Vitamin E levels were 4.302±1.54, which is lower than the normal range. The present study concludes that antioxidant plays a major role to fight against oxidative stress. So proper antioxidant should be taken.

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INTRODUCTION

Mental disorders were associated with a wide range of chronic illnesses, Alcohol usage disruptions, disability, and even mortality, particularly among elderly people (Patel *et al.*, 2018). Depression will be the second cause of disease identified by the WHO in 2020 (World Health Organization, 2017). The risk of suicide rises with depression (Behere *et al.*, 2017). Anxiety is an emotional state of antipathy in which the sense of fear is disproportionate to the magnitude of the risk. In certain psychological conditions, anxiety is involved (Weinberger, 2001). About one-

eighth of the total population worldwide have excessive anxiety (Eisenberg *et al.*, 1990).

Oxidative stress arises when the reactive oxygen species (ROS) are overproduced, or the cellular antioxidant defense mechanisms are deficient (Berg *et al.*, 2004; Kohen and Nyska, 2002). Maternal antioxidant protection mechanism, which through enzymatic induction counteracts the effects of free radicals, may prevent nitrosative stress (Gaikwad *et al.*, 2017).

Accumulating evidence indicates heightened oxidative stress could be involved in schizophrenia pathophysiology (Steullet *et al.*, 2017; Yao and Reddy, 2011). Schizophrenia is a psychiatric illness that weakens and affects around one per cent of the people. It is described by positive side effects (e.g., irregular attitudes and thinking), negative side effects (e.g. inability to feel pleasure and detachment from society), and impairment mental processes (Bitanihirwe and Woo, 2011). In its etiology, it is considered as multifactorial and heterogeneous, so that various pathological processes converge on a cluster of allied symptoms. Schizophrenia and other psychotic disorders are generally known as neurodevelopmental disorders, where several hits mount up throughout the crucial phase of development of CNS triggering the disorders (Hovatta *et al.*, 2010; Valko *et al.*, 2007). Most schizophrenic sufferers begin with a prodromal process marked by subclinical symptoms of the condition, which we will consign to after this clinically elevated psychosis risk state (Hassan *et al.*, 2014; Inoguchi, 2003).

In some trials, 22% of those who meet the CHR criterion lead to a year of record psychotic illness, compared with 0.015% healthy individuals (Xu *et al.*, 2014). Neurons are usually less resistant to free radical attacks and damaged antioxidant systems or disclosure to free radicals can cause destructive reactions with substrates critical for the continued existence of cells such as proteins, lipids, nucleic acids and lead to neuronal death (McDaniel, 1995; Lohr, 1991). Freshly, OS has involved and evidence is emerging to hold the role it plays in bipolar disorder (Cheeseman and Slater, 1993; Jesberger and Richardson, 1991).

SOD and GPx form an antioxidant protection mechanism next to essential harm and defend against damage to the cells and molecules (Andreazza *et al.*, 2007; Selek *et al.*, 2008). Oxidative stress typically results from excessive development of reactive oxygen species (ROS) or failure of the ROS controlling enzymatic and non-enzymatic processes (Savas *et al.*, 2006; Kensler *et al.*, 1983). The cause of multiple physical and mental disorders is responsible for oxidative stress. To counter the oxidative stress, the body has its antioxidant system, which tries to control the oxidative injury. ROS and reactive nitrogen species are the two main mechanisms that control oxidative activity in the body (Cotgreave *et al.*, 1988; Wendel *et al.*, 1980).

Excessive development of ROS in the body leads to further oxidative stress, resulting in loss of intracellular signalling and cellular ageing leading to apoptosis (Cotgreave *et al.*, 1988). Antioxidants like SOD, GPx, CAT, and non-antioxidants such as vitamin A, C, E, β-carotene, zinc, copper, selenium, and flavonoids act as free-scavengers, thereby reducing oxidative stress and resulting in cell injury (Riecher *et al.*, 1989; Häfner *et al.*, 1992). Reduced levels of Vit-C and E may not be adequate to fight ROS (Wasnik and Akarte, 2017).

A large proportion of the disorder has not been diagnosed by primary care doctors. Appropriate attention to psycho-neuro-endocrinological problems may help clinicians develop a more reliable and holistic view of patients and improve the likelihood of delivering the most appropriate care (Ambad *et al.*, 2020a). This highlights the need for more training to enhance early detection at this stage (Pal *et al.*, 2018). Knowledge of the endocrine system and minerals are important for the proper treatment of psychiatric disorders (Ambad *et al.*, 2020c,b).

In this study, we have observed levels of SOD, GPx, Vitamin C, and Vitamin E.

Aim and Objective

Aim

1. To study levels of SOD, GPx, Vitamin C, and Vitamin E in psychiatric disorders.

2. To study the levels of Vit-C and E before and after vitamin supplementations.

Objective

To correlate the levels of SOD, GPx, Vitamin C, and Vitamin E between psychiatric patients and healthy controls (age-matched) attending AVBRH Wardha and SMHRC Nagpur.

MATERIALS AND METHODS

The current study was done in the Department of Biochemistry and Dept. of Psychiatry at Datta Meghe Medical College, Shalinitai Meghe Hospital & Research Centre, Nagpur in collaboration with Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Sawangi (Meghe) Wardha Maharashtra.

Total of 100 subjects was selected for the study. Out of which 50 patients are age and gender-matched

healthy control, 50were suffered from psychiatric disorders. Informed consent was taken from all participants included in the study.

Sample Collection

Blood sample was collected and all patients and controls (n=100) gave informed consent for participation to the study.

GPx Measurement

GSH-Px movement was estimated by the strategy for Paglia and Valentine. The enzymatic response was started by adding H2O2 to the reaction mixture containing decreased GSH, diminished nicotinamide adenine dinucleotide phosphate and GR. The adjustment in the absorbance at 340 nm was checked by Shimadzu UV 1601 spectrophotometer. One unit of GSH-Px is characterized as micromoles of NADPH oxidized every moment. Action was given in units per liter plasma volume (Pal *et al.*, 2018).

SOD Measurement

SOD was resolved by the technique for Sun and partners. One unit of SOD was characterized as the measure of compound causing half inhibition in the NBT decrease rate. Activity was given in units per liter plasma volume (Ambad *et al.*, 2020c).

Estimation of vitamin C

Vitamin C was estimated by HPLC with electrochemical or ultraviolet light exposure (Ambad *et al.*, 2020b).

Estimation of vitamin E

Vitamin E was estimated by Modified simple method by baker and frank method and the technique by using 2,2'-bipyridyl, FeCl3 and C8H10. The complex of Fe^{+2} generated in this reaction with 2,2'-bipyridyl is determined by using a plain ELISA microplate at 492nm (Paglia and Valentine, 1967).

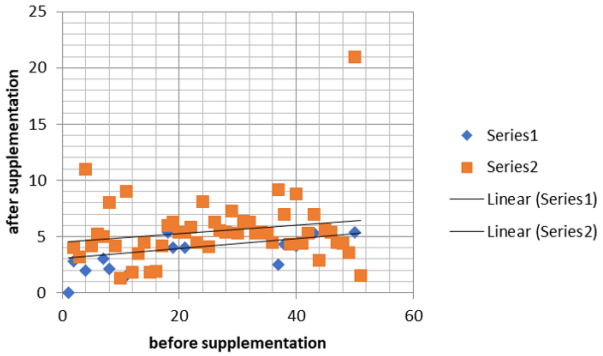
Inclusion Criteria

1. Anxiety disorders
2. Panic disorders
3. Social phobia
4. Depression
5. Bipolar disorders

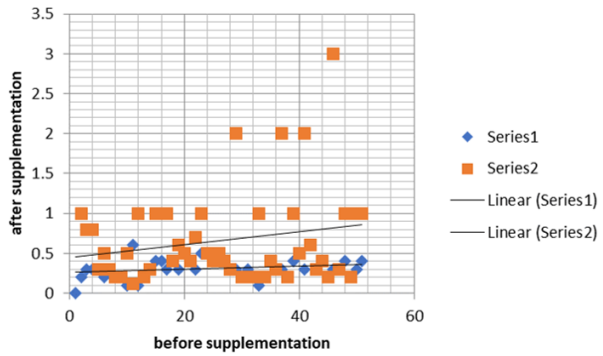
Statistical Analysis

All approximate findings were as mean ±SD. Mean values are determined by unpaired Student –t-test for meaning. Statistical analysis will be carried out using the Social Science software Statistical Kit (SPSS, 24.0). The categorical indicators would be used with frequencies and percentages. Probability values $p < 0.05$ is known as statistically important.

OBSERVATION AND RESULTS



Graph 1: Scatter diagram of Vitamin E before and after supplementation



Graph 2: Scatter diagram of Vitamin C before and after supplementation

Table 1 showed the levels of Antioxidants in Psychiatric patients was highly significant than the normal control group.

There is a significant correlation between vitamins in psychiatric patients and healthy controls with a p-value of <0.05 shown in Table 2.

Table 3 showed after the supplementation with different doses of vitamins, there is a slight increase in the values of Vitamins. There is a significant correlation between vitamins in psychiatric patients before and after supplementation with a p-value of <.05.

DISCUSSION

In a healthy being, the development and a variety of interactions with free radicals are closely regulated by enzymatic defence mechanisms such as SOD, GPx, or via the role of non-enzymatic antioxidants such

Table 1: Levels of Antioxidants in Psychiatric patients and Healthy control

Antioxidants	Cases Mean±SD (n=50)	Controls Mean±SD (n=50)
Superoxide dismutase (SOD)	135.26±24.68	178.5±38.48
Glutathione Peroxidase	1.591±3.35	3.564±2.24
Vitamin C	0.32±0.11	0.92±0.95
Vitamin E	4.302±1.54	6.69±10.35

Table 2: Correlation of Antioxidant levels between cases and control

Antioxidants	Cases Mean±SD (n=50)	Controls Mean±SD (n=50)	t-value	p-value
Superoxide dismutase (SOD)	135.26±24.68	178.5±38.48	6.688	0.0001
Glutathione Peroxidase	1.591±3.35	3.564±2.24	3.462	0.0008
Vitamin C	0.32±0.11	0.92±0.95	4.436	0.0001
Vitamin E	4.302±1.54	6.69±10.35	1.614	0.1098

P<0.05

Table 3: Correlation of Antioxidant status before and after supplementation in psychiatric patients

Antioxidant Status	Before Supplementation	After Supplementation	Vitamin Doses	t value	P-value
Vitamin E	4.302±1.54	5.526±2.97	400IU/day	2.587	0.0111
Vitamin C	0.32±0.11	0.66±0.56	500mg/day	4.213	0.0001

P<0.05

as Vit-C, E and GSH. Graph 1 shows the effect of Vit E on psychiatry patients. Graph 2 shows the effect of Vit C on psychiatry patients. Highly development of free radicals and compromised defence mechanisms, however, a guide to oxidative stress and effect in radical, induced lipid, protein and DNA damage (Sun *et al.*, 1988).

Vit-C is a co-substrate for lots of enzymes, serving to stimulate antioxidants and increasing the effects of other compounds, such as Vit-E (Robitaille and Hoffer, 2015). Vit-E is viewed as the primary line of guard against lipid peroxidation, it shields cell films from free radical harm (Jargar *et al.*, 2012). Vit-C and Vit-E work together by having both hydrophilic and hydrophobic properties, providing a complete antioxidant defence (Powers *et al.*, 2004). Tocopherols and tocotrienols (vit-E) and Vit-C respond with free radicals, prominently peroxyl radicals, and with singlet atomic oxygen, this being the premise of their capacity as a cancer prevention agent.

Vit-C is a fundamental cofactor for α-ketoglutarate-subordinate dioxygenases. Vit-C-subordinate inhibition of the HIF pathway may give elective or extra ways to deal with controlling tumor movement, contaminations, and irritation. Vit-E works as a basic lipid-dissolvable cancer prevention agent, searching hydroperoxyl radicals in a lipid milieu. Human manifestations of Vit-E lack propose that its cancer prevention agent properties assume a key job in securing erythrocyte films and sensory issues. As a cancer prevention agent, Vit-C gives the security against oxidative pressure prompted cell harm by searching ROS, by Vit-E-subordinate balance of lipid hydroperoxyl radicals, and by shielding proteins from alkylation by electrophilic lipid peroxidation items. These bioactivities bear pertinence to inflammatory disorders (Powers *et al.*, 2004; Traber and Stevens, 2011).

CONCLUSIONS

The result of this study indicates that, in psychiatric disorders, the serum levels of SOD, GPx, Vit-C and Vit-E decrease, Low level of vit-C and E levels can not suffice to counter ROS and the level of antioxidant in the serum has been compromised to fight oxidative stress. Antioxidants supplementation has provided some positive results in the treatment of neuropsychiatric disorders. These findings indicate that antioxidants should be studied either as an alternative therapy or as an adjunct to traditional medications, telepsychiatry diagnosis method has the ability to allow correctly and effectively diagnose psychological conditions antioxidants are

usually Extremely low chance drugs and their use may before effective compared to the medicines that have been developed.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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