

PERIPHERAL NON- ENZYMATIC ANTIOXIDANTS LEVELS IN SCHIZOPHRENIA AND BIPOLAR ILLNESS A COMPARATIVE CROSS-SECTIONAL STUDY

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Abstract

Background: Nervous tissue is extremely sensitive to oxidative damage. Recent studies show an elevated level of oxidative stress indicators in Schizophrenia. Current studies on oxidative stress in Schizophrenia mainly focus on enzymatic antioxidants, while limited studies have been carried out on non-enzymatic antioxidants. Some studies discovered that plasma non-enzymatic antioxidants (uric acid, bilirubin, and albumin) in Schizophrenia are lower than those of healthy controls.

Aim: To compare levels of nonenzymatic antioxidants in Schizophrenia and bipolar illness.

Material and Methods: The present study is a hospital-based cross-sectional study conducted among 100 patients with Schizophrenia and Bipolar Affective disorder included as per inclusion and exclusion criteria and undergone psychiatric assessment as per diagnostic criteria.

Results: S. albumin, S. bilirubin, S. uric acid were found to be low in Schizophrenia but statistically, the significant difference was evaluated for S. uric acid.

Conclusion: S. uric acid lower significant levels in Schizophrenia as compared to bipolar affective disorder shows the more impaired peripheral antioxidant scavenging system in Schizophrenia. However, pure peripheral antioxidant system dysfunction could not be ascertained in Schizophrenia through this study.

Keywords: nonenzymatic antioxidants, Schizophrenia, bipolar illness.

Introduction

Oxidative stress is defined as the imbalance between reactive oxygen/nitrogen species (ROS/RNS) and antioxidant protection systems. Increasing oxidative stress leads to the deleterious oxidation and chemical modification of biomacromolecules such as lipids, DNA, and proteins.(1,2,3) Antioxidant refers to any compound which can lower oxidative stress by depleting molecular oxygen or decreasing its local concentration, removing pro-oxidative metal ions, trapping aggressive reactive oxygen species, scavenging chain-initiating radicals, breaking the chain of a radical sequence, or quenching singlet oxygen. (4,5) Redox homeostasis involves the antioxidant defense system, which includes enzymatic antioxidants and nonenzymatic antioxidants (6,7) antioxidant system in the cell with three key enzymes: superoxide dismutase, catalase, and glutathione peroxidase; the latter is the main antioxidant system in the extracellular fluid (such as plasma, cerebrospinal fluid), mainly including vitamin A and C, tocopherol, glutathione, uric acid (UA), albumin (ALB), bilirubin(8,9). Nervous tissue is extremely sensitive to oxidative damage caused by ROS or RNS. The mechanism of oxidative stress in SCZ is yet not clear, but oxidative stress might be involved in the pathophysiology of SCZ (10-14).

Recent studies show an elevated level of oxidative stress indicators in Schizophrenia. An autopsy study conducted by

Yao et al. found that level of nitric oxide in the caudate nucleus of schizophrenic patients was significantly higher than that of healthy controls, indicating that there was a difference in oxidative stress in different brain regions of schizophrenic patients.(11) Current studies on oxidative stress in Schizophrenia mainly focus on enzymatic antioxidants, while limited studies have been carried out on non-enzymatic antioxidants.

Some studies discovered that plasma non-enzymatic antioxidants (uric acid, bilirubin, and albumin) in Schizophrenia are lower than those of healthy controls. Reddy et al. found that levels of UA, total bilirubin (TBIL), and ALB in Schizophrenia were significantly lower than those of healthy controls and were affected by gender. (15,16)

Aim

To compare levels of nonenzymatic antioxidants in Schizophrenia and bipolar illness.

Objective

To determine the differences in peripheral levels of non-enzymatic antioxidants between patients with schizophrenia and bipolar affective illness

Methodology

After taking permission from the Institutional Ethical Committee, the study was carried out and patients were recruited from the inpatient department of psychiatry, MDM Hospital Jodhpur through simple randomized sampling. The Sample size was calculated to be 100.

Study design: A cross_ sectional study.

Informed consent was taken from the patient or caregiver if the patient was not able to give proper written informed consent.

Inclusion Criteria

1. Bipolar illness and schizophrenic patients:15–65years of age
2. Previously diagnosed with Schizophrenia and Bipolar affective disorder.

Exclusion Criteria

- (1) Combined with organic brain diseases or brain trauma and chronic physical illness

- (2) Positive in urine pregnancy test or lactating females.

Procedure

The Blood sample of 5ml was taken through a venous puncture and after centrifugation processing of the sample was done in the central laboratory, MDM Hospital, Jodhpur. Serum values of Uric acid, albumin, and total bilirubin were evaluated.

Statistical analysis

Comparative analysis of different values done. Differences in continuous variables among groups are being assessed by the independent samples t-test. The paired samples test is adopted to evaluate changes in UA, ALB, TBIL. Epiinfo7 software was being utilized for measurements and analysis.

Results:

Table 1: Patients distribution:

Male	65
Female	35
Schizophrenia diagnosis	56
Bipolar Affective Disorder	44
Mean age (male)	37.7 years
Mean age (Female)	38.3 years

Table 2: Mean values of parameters

	Schizophrenia	Bipolar Affective Disorder
S. Albumin (in mg) mean	3.712 ,S.D .70	3.85,S.D .36
S.bilirubin	.47,S.D .51	.48,S.D .25
S.Uric Acid	4.1,S.D 1.0.	5.08,S.D 1.01

Table 3: Statistical t values and p -values

	t value	p value
S. Albumin	.946	.34
S. Bilirubin	.08	.93
S. Uric acid	2.8	.005

Table 4: Gender wise values of parameters

Schizophrenia	Male	Female	P value
S.Albumin in mg	3.5	3.9	.11
S.Bilirubin	.44	.51	.17
S.Uric acid	4.7	3.4	.004

Table 5:

Bipolar affective Disorder	Male	Female	P value
s.Albumin in mg	3.8	3.7	.434
s.bilirubin	.55	.31	.034
s. Uric acid	5.27	3.17	.040

1. Serum albumin(mg/dl) in Schizophrenia mean value 3.712 with S.D .7032 lower as compared to bipolar affective disorder mean value 3.8577 with S.D .36. However, t value 0.946 and p value (.348)>.05,hence difference is not significant.

2. Serum Total Bilirubin in Schizophrenia mean value 0.47 with S.D 0.51 mg/dl is low as compared to Bipolar affective disorder with mean value .48 and S.D .25 mg/dl. However, t value is .08 and p value (.93)> .05 hence no significant difference is not present.

3. Serum Uric Acid in mg/dl Schizophrenia mean value 4.11 with S.D 1.0793 is lower as compared to Bipolar affective disorder mean value 5.08 with S.D 1.4719. t value is 2.8 and pvalue is equivalent to .005 hence difference in value is significant.

Hence levels of S. albumin, S.bilirubin, S.uric acid were found to be low in Schizophrenia but statistically, the significant difference was evaluated for S.uric acid.

Discussion

Schizophrenia has a complex neuropathological mechanism involving neurotoxicity by oxidants and an impaired defense system of antioxidant mechanism(8). It involves non -enzymatic antioxidants as well as Uric acid, albumin, bilirubin(17) UA, the end product of purine metabolism can scavenge reactive radicals. Impaired lower levels are associated with decreased defensive mechanisms. In this study lower levels of uric acid in Schizophrenia patients were found as compared to bipolar illness showing more impaired in Schizophrenia(18).

ALB is an endogenous antioxidant with radical scavenging properties(4). In this study albumin levels were found to be lower in Schizophrenia as compared to bipolar affective disorder but the significant difference is not present. It might be due to a short course of study in which acute oxidation stress might be present.

Bilirubin is the end product of heme-catabolism responsible for antioxidative mechanisms through scavenging peroxy radicals and acting as a chain-breaking antioxidant(19). In this study, no significant difference could be found between Schizophrenia and bipolar affective disorders patients.

Hence this study and its findings do not correlate completely with the findings of the study done by Ravinder reddy et al which concluded significant differences in levels of S albumin, S.uric acid, and S.bilirubin in patients with schizophrenia and bipolar affective disorder, lower values in Schizophrenia(20).

In this study, S.uric acid shows the near to significant difference between Schizophrenia and bipolar illness and this finding is supportive for study previous done.

There are a few limitations to this study. Firstly, the levels of peripheral albumin, bilirubin, and uric acid are susceptible to diet, but this study did not strictly control the diet. (21,22,23)Secondly, more indicators should be

investigated to verify further the conclusion (such as total antioxidant capacity, lipid peroxides, ascorbic acid, and thiols). Thirdly, some studies suggested that the peripheral antioxidant capacity is consistent with the central nervous system(24). However, this finding is not be assessed directly. Fourthly, the study did not limit the treatment. Moreover, limited and short study duration and not a large sample might be limiting.

Conclusion

S. uric acid lower significant levels in Schizophrenia as compared to bipolar affective disorder shows the more impaired peripheral antioxidant scavenging system in Schizophrenia.

However, pure peripheral antioxidant system dysfunction could not be ascertained in Schizophrenia through this study.

Limitation

Cross_ sectional nature of the study with less number of patients recruited to conduct the study. A further follow_ up study is required in the future for detailed elaboration.

Future direction:

A further comprehensive assessment should be done for nonenzymatic antioxidants in these chronic psychiatric disorders.

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