

COMPARISON OF ANTIOXIDANT VITAMINS AND ENZYMES IN ALCOHOLIC LIVER DISEASE IN A TERTIARY CARE CENTRE

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Abstract

Background: The liver is the largest site of metabolism activities and provides the primary site for alcohol metabolism. Hence detoxification of the liver by alcohol occurs at the expense of antioxidants, vitamins, and enzymes. **Materials and Methods:** 100 alcoholic liver disease patients were compared with the same number of healthy (controlled) groups. Clinical and laboratory investigations were carried out using venous blood plasma vit. E levels by the Baker-Hatal method, ascorbic acid by the Teitz method, and SVD by the Beers-Seizer method. **Result:** The comparison of non-enzymatic oxidant parameters. Ascorbic acid, vitamin E, and the comparison of antioxidant enzymes SOD and GPX in both groups were statistically highly significant ($p < 0.00$). **Conclusion:** It is confirmed that increased anti-oxidant enzymes except catalase and decreased non-enzymatic oxidants have diagnostic value in alcoholic liver disease patients. This study will help clinicians treat such patients efficiently to avoid morbidity and mortality.

INTRODUCTION

Alcohol is a constituent of a regular diet for a major group of people, taken on a voluntary basis. Chronic and excessive alcohol consumption produces its deleterious effect directly or indirectly. It accelerates the oxidative mechanism via increased production of reactive oxygen species. It is widely accepted that oxidative stress plays a central role in alcohol-induced pathogenesis.^[1,2]

The liver provides the primary site for alcohol metabolism; therefore, the effects of alcohol are more pronounced in the liver than in any other organ. In liver detoxification of ingested food or drugs, including alcohol, cytochrome molecules use molecular oxygen and generate ROS. The oxidative damage is further potentiated by an alcohol-induced decrease in anti-oxidant enzymes and chemicals. Ros is directly involved in the activation of NFKB and AP-I. NF-KB activation triggers the induction of inflammatory genes and initiates various chronic inflammatory diseases as well as apoptosis.^[3]

Because of its anti-oxidant properties, vitamin E is believed to prevent diseases associated with oxidative stress, such as CVD, cancer, chronic inflammation, and neurological disorders. Hence, an attempt was made to evaluate and compare anti-oxidant vitamins and enzymes in patients with alcoholic liver diseases.^[4]

MATERIALS AND METHODS

100 (one hundred) adult patients regularly visiting the Medicine Department of Kurnool Medical College Kurnool, Andhra Pradesh-518002 and giving their consent in writing were selected for study.

Inclusion Criteria

Alcoholic liver disease patients aged between 25 years to 50 years who gave their consent in writing were selected for study.

Exclusion Criteria

Non-alcoholic liver disease patients; malignancy of the liver; patients with renal, cardiovascular, and other systemic diseases. Immune compromised patients were excluded from the study.

Method: A detailed clinical examination and laboratory investigations were done in both 100 controlled (group A) and 100 alcoholic liver disease patients (group B). The venous blood samples were taken from each patient and used for the estimation of ascorbic acid, SOD (superoxide dismutase), GPX (glutathione peroxide), catalase, and MDA (malondialdehyde) in erythrocytes and vitamin E in plasma. The venous blood samples for the analysis were taken in a fasting state and under aseptic conditions. Plasma was separated by centrifugation at 100 rpm for 15 minutes. Separated plasma was used for the measurement of the activity of vitamin E. Ascorbic acid levels were estimated in plasma by the method of Teitz.^[5] Plasma vitamin E levels were

estimated by the method of Baker Hetal. SOD (EC1.15.1.1) activity was determined in the hemolysate by the method of Beers and Sizer. The activity of glutathione peroxidase GPXEC (1.11.1.9) was measured as described by pagila and valentine in erythrocytes. All reagents used were analytic reagents obtained from Sigma Chemicals, St. Louis, Missouri (MO).

The duration of the study was from January 2023 to August 2024.

Statistical analysis: The non-enzymatic oxidant values and antioxidant values in both groups were compared with the z test, and significant results were noted. The statistical analysis was carried out in SPSS software. The ratio of males and females was 2:1.

RESULTS

[Table 1] Comparison of values of non-enzymatic parameters in healthy controlled groups and alcoholic liver disease patients

- Ascorbic acid (mg/dl): 1.62 (\pm 0.26) in the controlled group, 1.46 (\pm 0.22) in the alcoholic liver disease patients group, t test 4.69 and $p < 0.001$.
- Vitamin E: 1.75 (\pm 0.45) in controlled group, 1.40 (SD \pm 0.38) in alcoholic group, t test 5.94 and $p < 0.001$.

[Table 2] Comparison of antioxidant enzymes in controlled and alcoholic liver disease groups

- SOD (U/mg of protein): 8.02 (\pm 0.78) in controlled group, 16.04 (\pm 0.78) in alcoholic group; t test was 84.03 and $p < 0.001$.
- GPX: 26.07 (\pm 1.40) in the controlled group, 46.38 (\pm 1.28) in the alcoholic group, t test was 10.7 and $p < 0.001$

- Catalase: 11.20 (\pm 0.36) in the controlled group, 8.60 (\pm 0.27) in the alcoholic group; t test was 5.77 and $p < 0.001$.

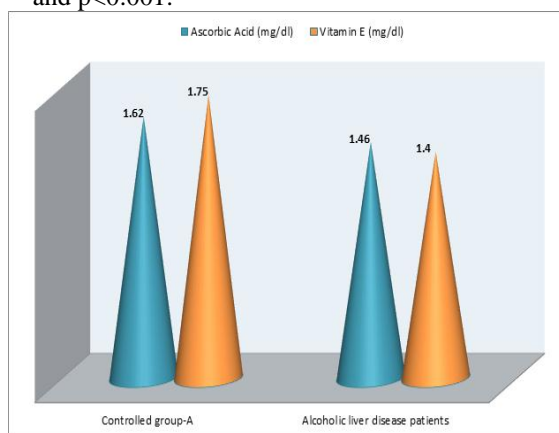


Figure 1: Comparison of values of Non-enzymatic parameters in healthy (controlled group) and alcoholic liver disease patients

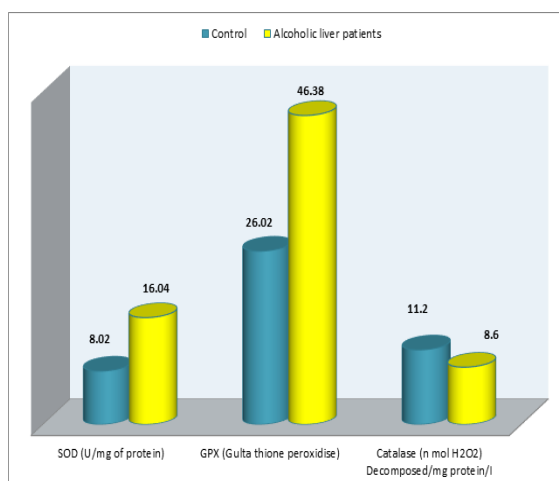


Figure 2: Comparison of antioxidant enzymes in both groups (controlled group and alcoholic liver patients).

Table 1: Comparison of values of Non-enzymatic parameters in healthy (controlled group) and alcoholic liver disease patients

Parameters of Non-Enzyme oxidants	Controlled group-A (No. of patients 100) Mean value with SD	Alcoholic liver disease patients group-B (No. of patients 100) Mean value with SD	t test	p value
Ascorbic Acid (mg/dl)	1.62 (\pm 0.26)	1.46 (\pm 0.22)	4.69	$P < 0.001$
Vitamin E (mg/dl)	1.75 (\pm 0.46)	1.40 (\pm 0.38)	5.94	$P < 0.001$

Table 2: Comparison of antioxidant enzymes in both groups (controlled group and alcoholic liver patients)

Parameters	Control group-A No. 100	Alcoholic liver patients group-A No. 100	t test	p value
SOD (U/mg of protein)	8.02 (\pm 0.55)	16.04 (\pm 0.78)	84.03	$P < 0.001$
GPX (Gulta thione peroxidise)	26.02 (\pm 1.40)	46.38 (\pm 1.28)	10.7	$P < 0.001$
Catalase (n mol H2O2) Decomposed/mg protein/l	11.20 (\pm 0.36)	8.60 (\pm 0.27)	5.77	$P < 0.001$

All three parameters of anti oxidant enzyme are highly significant ($p < 0.001$)
 SOD= Super Oxidedismatase, GPX = Gluta-thioneperoxidase

DISCUSSION

Present a comparative study of anti-oxidant vitamins and enzymes in alcoholic liver diseases in the Andhra Pradesh population. Ascorbic acid (mg/dl) vitamin E was compared in healthy and alcoholic liver disease

patients with a significant p value [Table 1]. Similarly, the antioxidant parameters superoxide dismutase (SOD), glutathione peroxidase (GPX), and catalase (mmol H2O2) were compared in controlled and alcoholic liver disease patients, and every parameter has a significant p value ($p < 0.001$)

[Table 2]. These findings are more or less in agreement with previous studies.^[5-7]

It is widely accepted that oxidation stress plays a central role in alcohol-induced pathogenesis. The liver provides the primary site for alcohol metabolism; therefore, the effects of alcohol are more pronounced in the liver than in any other organ. Here, the detoxification of a variety of compounds in our ingested foods or drugs, including alcohol, by cytochrome P450 molecules uses molecular oxygen and generates ROS. The oxidative damage is further potentiated by an alcohol-induced decrease in antioxidant enzymes and chemicals, particularly glutathione. ROS, either directly or via their generation via mitochondria, are involved in the activation of oxidative stress; activation triggers the induction of inflammatory genes and plays a role in the initiation and progression of chronic inflammatory diseases. A significant decrease in non-enzymatic oxidant parameters, i.e., ascorbic acid and vitamin E, and an increase in the antioxidant enzymes (SOD GPX) clearly suggest an increase in defense against oxidant and non-oxidant damage to liver tissue.^[8] It is reported that the level of erythrocyte MDA (malondialdehyde) was significantly higher in patients with alcohol-induced liver disease due to liver damage caused by excess dosages of ethanol, and ethanol toxicity reduces the catalase levels by generating excess ROS, leading to the production of oxidative stress. On the other hand, acetaldehyde, the metabolic product of ethanol oxidation by alcohol dehydrogenase or by cytochromes, causes the consumption of antioxidants, the activation of antioxidants, and the increased generation of free radicals.^[9]

Chronic alcohol feeding increases API (activator protein-1) expression in the liver. Activation of API by chronic alcohol is likely to be important in mediating the inflammatory phase of alcohol-induced liver injury, as API regulates the transcription of genes involved in the inflammatory response.^[10]

The decreased concentration of measured antioxidant enzymes in alcoholic hepatitis could probably be associated with oxidative stress and/or a decreased anti-oxidant defense mechanism.^[11] GPX (glutathione peroxidase) activity was found to be decreased in alcoholic patients in comparison to healthy subjects. It clearly indicates an imbalance between oxidant and anti-oxidant defensive systems in the body under such a pathological scenario.

Vitamin E is a potent antioxidant, and its role as an inhibitor (chain breaker) of lipid peroxidation is well established. Alcohol appears to interfere with the body's normal vitamin E content; hence, patients with an alcoholic liver exhibit reduced vitamin E.^[12] Hence, disease (ALD) can ultimately define the diagnosis according to the typical presence and distribution of hepatic steatosis, inflammation, and Mallory-Denk bodies. Because of the potential

reversible nature of ALD with sobriety, regular screening of the alcoholics and early diagnosis are essential.

CONCLUSION

Present a comparative study of levels of antioxidants, vitamins, and enzymes in alcoholic liver disease patients and a controlled group. There was a significant increase in the values of antioxidants, vitamins, and catalyze activities in alcoholic liver disease patients as compared to the normal group because there is increased oxidative stress in alcoholic liver disease patients. To regulate the increased oxidative stress, these vitamins, antioxidants, and enzymes act as compensatory roles to normalize liver functions. Hence, there is a significant increase in the levels of vitamins, antioxidants, and enzymes. This study demands further pathophysiological studies in a large number of patients of both sexes at different age groups to confirm these positive findings with the latest biotechnological methods because the exact etiopathogenesis of alcoholic liver diseases is still unclear.

Limitation of study: Owing to the tertiary location of the research center, the small number of patients, and the lack of the latest techniques, we have limited findings and results.

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