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Original Research Article

Comparative Study of Antioxidant Vitamins and Enzymes in Alcoholic Liver Diseases in Telangana Population

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Conflict of interest: Nil

Abstract:

Background: The liver is the largest site of metabolism in the body. It also provides the primary site for alcohol metabolism. It leads to oxidative damage due to alcohol, which causes a decrease in anti-oxidant enzymes and chemicals.

Method: 60 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 Baker Hatal method, ascorbic acid by the Teitz method, and SVD by the Beers-Seizer method.

Results: The comparison of non-enzymatic oxidant parameters. Ascorbic acid, vitamin E, and the comparison of anti-oxidant enzymes SOD, GP_X in both groups were statistically highly significant ($p<0.00$).

Conclusion: The present study indicates that alcohol promotes oxidative stress, a major cause of alcohol toxicity in liver Vitamin E is a potential therapeutic agent for alcohol-induced oxidative damage in liver.

Keywords: antioxidants, vitamin E, superoxide (SOD), glutathione peroxidase (GPX), catalase, Telangana.

Introduction

Alcohol liver disease (ALD) is a progressive and one of the major causes of morbidity and mortality in developing countries like India. Chronic consumption of alcohol causes the accumulation of fatty acids in hepatocytes, and there will be a decrease in the functional capacity of the liver [1]. The ingested alcohol in chronic alcoholics produces various intermediate and highly reactive metabolites that alter the metabolic pathways of the liver [2].

Alteration of metabolic pathways leads to the production of reactive oxygen species (ROS), which have high oxidant properties and are also called free radicals. These free radicals cause lipid peroxidation, which is considered to be the major mechanism of cell membrane destruction and damage to liver cells [3]. Free radicals form in both physiological and pathological conditions of mammalian tissue. The uncontrolled production of free radicals plays an important role in tissue damage induced by several pathophysiological conditions. Under the influence of free radicals and the presence of oxidative damage, chronic alcoholism shows an alteration in the oxidant-antioxidant profile [4]. Hence, an attempt is made to evaluate the antioxidant values in chronic alcoholic patients as adults and compare them with those of normal, healthy volunteers.

Material and Method

60 (sixty) adult patients regularly visiting the Medicine Department of Pratima Institute Medical Sciences Hospital, Kareem Nagar, Telangana-500096 were studied.

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 60 controlled (group A) and 60 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 peroxide 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 December 2023 to June 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.

Observation and Results

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

- Non-enzyme oxidants: ascorbic acid (mg/dl) 1.60 (SD± 0.28) in controlled and 1.49 in the alcoholic group, t test 2.22 and p<0.001.
- Vitamin E: 1.76 (SD± 0.48) in the controlled group, 1.44 (SD± 0.42) in the alcoholic group, t test 3.88, and p<0.001.

Table 2: Comparison of antioxidant enzymes in both groups

- SOD: 8.05 (SD± 0.58) in the controlled group, 14.08 (SD± 0.80) in the alcoholic group; t test was 47.2 and p<0.001.
- GPX: 26.06 (SD± 1.42) in the controlled group, 45.40 (SD± 1.30) in the alcoholic group, t test was 77.8 and p<0.001
- Catalase (nmol H_2O_2): 11.28 (SD± 0.38) in the controlled group, 9.62 (SD± 0.29) in the alcoholic, t test was 26.8 and p<0.001.

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 60) Mean value with SD	Alcoholic liver disease patients group-B (No. of patients 60) Mean value with SD	t test	p value
Ascorbic Acid (mg/dl)	1.60 (± 0.28)	1.49 (± 0.25)	2.22	P<0.02
Vitamin E (mg/dl)	1.76 (± 0.48)	1.44 (± 0.42)	3.88	P<0.001

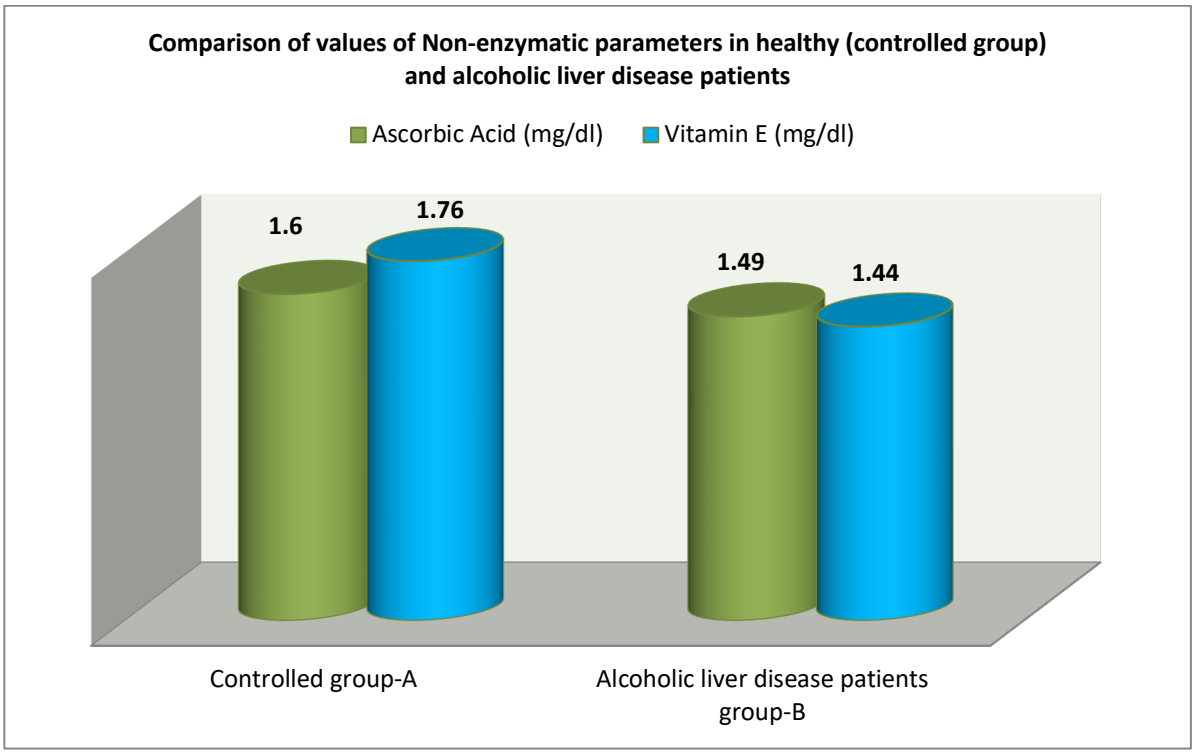

Figure 1: Comparison of values of Non-enzymatic parameters in healthy (controlled group) and alcoholic liver disease patients

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

Parameters	Control group-A No. 60	Alcoholic liver patients group-A No. 60	t test	p value
SOD (U/mg of protein)	8.05 (± 0.58)	14.08 (± 0.80)	47.2	P<0.001
GPX (Glutathione peroxidise)	26.06 (± 1.42)	45.40 (± 1.30)	47.2	P<0.001
Catalase (n mol H_2O_2) Decomposed/mg protein/I	11.28 (± 0.38)	9.62 (± 0.29)	26.8	P<0.001

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

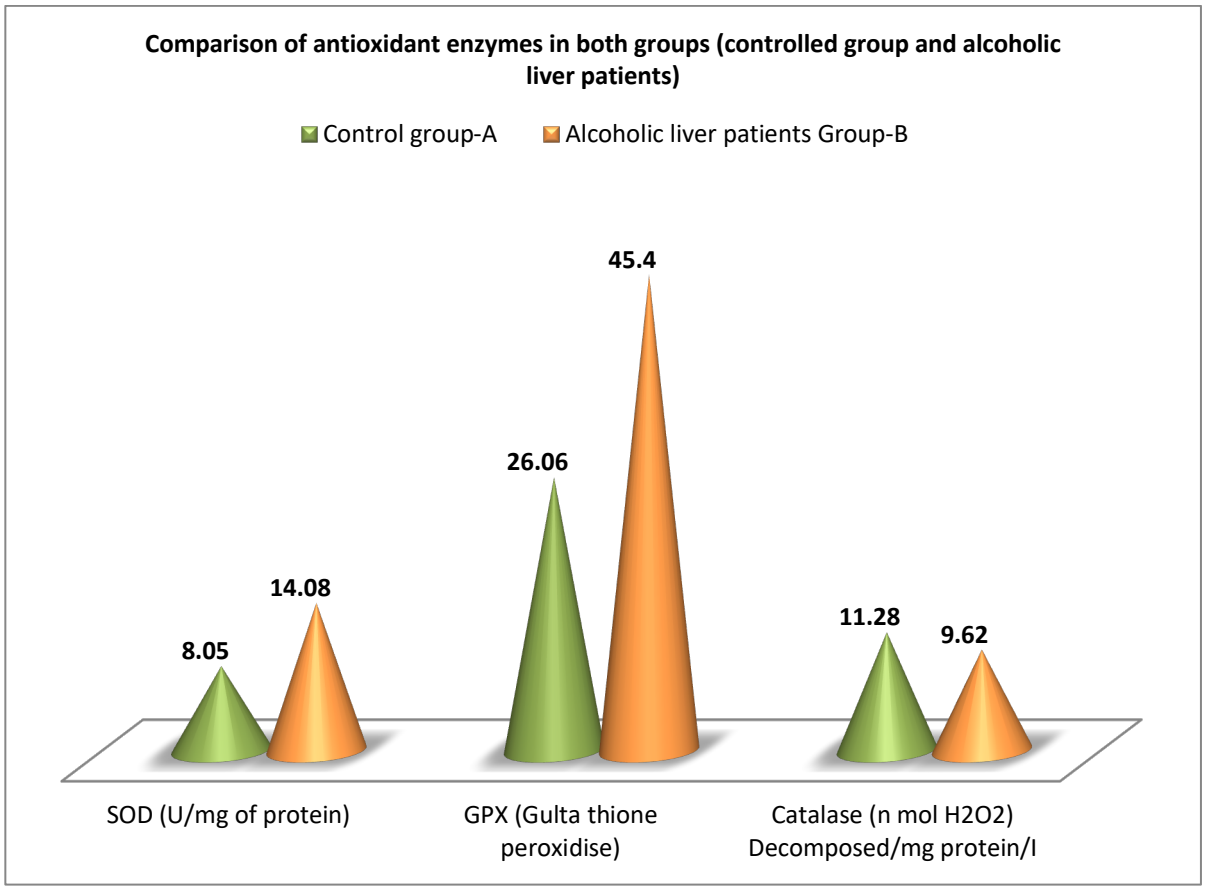

Figure 2: Comparison of antioxidant enzymes in both groups (controlled group and alcoholic liver patients)

Discussion

Present a comparative study of anti-oxidant vitamins and enzymes in alcoholic liver diseases in the Telangana population. Ascorbic acid (mg/dl) vit 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 [5,6,7]. 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 (malandialdehyde) 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 AP1 (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 anti-oxidant 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.

Summary and 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 catalyse 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 aetio-pathogenesis of alcoholic liver diseases is still unclear.

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

This research work is approved by Ethical committee of Pratima Institute of Medical Sciences Kareem Nagar, Telangana-505417.

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