Research Paper

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Serum Levels of Ascorbic Acid in Chronic Alcoholic Patients (with and Without Liver Damage) Attending De-Addiction Centre

Medical Science

KEYWORDS : Alcoholic liver disease, oxidative stress, ascorbic acid.

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ABSTRACT

Background: Alcohol is one of the leading cause of preventable mortality in the world. Oxidative stress is proposed to be critically involved in numerous diseases, including Alcoholic Liver Disease (ALD). Ethanol consumption causes a marked alteration of antioxidant metabolism in the liver, which renders the liver more susceptible to free radical attack. Methods: Blood samples were collected for estimating serum Alanine aminotransferase (ALT) and antioxidant vitamin (Ascorbic acid). 41 subjects, ranging in age from 21 to 71 years were taken, out of which 16 were chronic alcoholics with liver damage, 15 were chronic alcoholics without liver damage and 10 were healthy controls (non-alcoholics). Statistical analysis was done among the controls and the two patient groups. Results: It was observed that there was a significant decrease in the serum ascorbic acid levels and increase in serum alanine amino transferase (ALT) in alcoholics with liver damage as compared to alcoholics without liver damage and healthy controls. Conclusions: The results of the present study confirms that chronic ethanol use enhances the hepatic consumption of antioxidant vitamin (Ascorbic acid), probably caused by increased formation of reactive oxygen species (free radicals), induced by ethanol.

Introduction:
Alcohol consumption is the most common cause of liver disease in the world which is entirely preventable. Alcoholism can lead to various medical complications, like perturbed alcohol metabolism, liver cirrhosis and hormonal changes associated with pancreatitis, osteoporosis, immune impairment and impaired fertility[1].

Reactive aldehydic products resulting from ethanol induced oxidative stress play a pivotal role in the pathogenesis of alcoholic liver injury[2]. Reactive aldehyde & hydroxyl radicals formed in alcoholics attack amino acid residues of proteins and forms stable and unstable adducts with proteins and cell constituents. Cell functions are disturbed with damage to proteins, nucleic acids and lipids[3].

Materials and Methods:
Control (non-alcoholic) subjects were selected from the general population. Chronic alcoholic patients (cases) were taken from the De-addiction ward of S.M.S. Hospital, Jaipur, Rajasthan. All the subjects were examined and they gave informed consent for blood sampling for the present study. Subjects between 21 to 71 years of age were included in the study. 41 subjects (Males) were included, out of which 16 were chronic alcoholics with liver damage (Group I), 15 were chronic alcoholics without liver damage (Group II) and 10 healthy controls (non-alcoholics).

Exclusion criteria for patients and controls were:
1. Subjects below 21 and above 71 years were excluded from the study. Patients with medical disorders like cancer, diabetes, lung disorders, renal disease and cardio vascular disease were excluded from the study.
2. Patients with other substance abuse like cannabis, nicotine etc. were excluded.
3. Subjects taking antioxidant vitamins and minerals or other supplements were excluded.
4. Smokers were excluded.
5. Patients taking any drug which could affect antioxidant status were excluded.
6. Patients with other diseases of liver e.g. viral hepatitis, etc. were also excluded from the study.

Clinical examination of all the subjects was done and history of present and past illness, family history, personal history (smoking, history of alcohol intake-duration, type of alcohol and quantity) was carefully recorded. Venous blood samples were taken after overnight fast in plain vials. Blood was allowed to clot and serum was separated by centrifugation.

i. Serum Ascorbic acid level was estimated by using Dinitrophenyl Hydrazine method[4].
ii. Serum Alanine Aminotransferase level by Reitman and Frankel method[5] (Kit method).

Statistical analysis:
All the values were statistically analysed. The results obtained were expressed as Mean ± Standard Deviation (S. D.)

Results:
Serum Ascorbic acid was found to be in the range of 0.44 to 1.32 mg/dl in controls (non-alcoholics), with an average of 0.77 ± 0.23 mg/dl. Serum vitamin C level was in the range of 0.32 to 0.52 mg/dl, with an average of 0.44 ± 0.06 mg/dl in chronic alcoholics without liver damage. Ascorbic acid level was in the range of 0.11 to 0.4 mg/dl with a mean of 0.26 ± 0.08 mg/dl in chronic alcoholics with liver damage.Thus, serum Ascorbic acid levels in Group I (Chronic alcoholics with liver damage) patients were significantly lower than group II (Chronic alcoholics without liver damage). ($P < 0.001$).Also, there was a significant difference in the serum vitamin C levels between Group I (Chronic alcoholics with liver damage)and Group III (Controls/ Non alcoholics) ($P < 0.001$). Serum vitamin C was significantly lower in group II (Chronic alcoholics without liver damage) than group III (Controls). ($P < 0.001$). (Tables 1 & 2, Figure No. 1)

Serum Alanine aminotransferase levels in controls was in the range of 10 to 30 units/ml with a mean of 19.7 ± 7.14 units/ml. Serum ALT was in the range of 19 to 38 units/ml with a mean of 30.47 ± 6.16 units/ml in alcoholics without liver damage. In chronic alcoholics with liver damage, serum ALT was in the range of 21 to 380 units/ml with the mean of 98.5 ± 86.94 units/ml.(Table No.3)

When the group I (Chronic alcoholics with liver damage) patients were compared with group II (Chronic alcoholics without liver damage) patients, serum ALT values were significantly higher in group I patients. ($P< 0.01$).

Serum ALT values when compared between group I (Chronic alcoholics with liver damage) patients and group III (Controls), the ALT values were significantly higher in group I patients. ($p <0.025$). The values of serum ALT in group II (Chronic alcoholics without liver damage) patients were compared with group III (controls) and serum ALT was found significantly higher in group II patients. ($p< 0.001$) (Table No. 4, Figure-2)

Table No. 1
Serum Vitamin C level (Values Mean ± SD) in control and case groups

Group	No. of patients	Vitamin C
Chronic Alcoholics with liver damage (Group I)	16	0.26± 0.087
Chronic Alcoholics without liver damage (Group II)	15	0.44±0.063
Control (Non alcoholics) (Group III)	10	0.77±0.238

Table No. 2
Comparison of serum vitamin C level between cases and controls

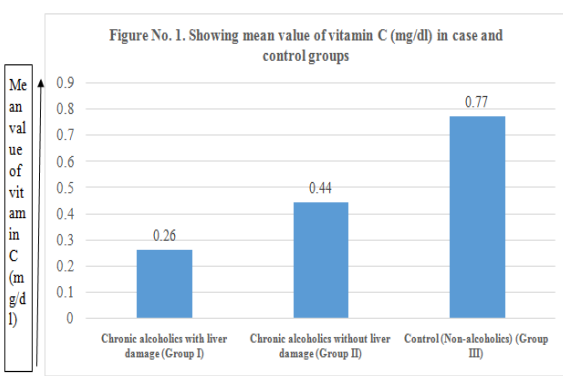
Group	P value	Significance
Group I v/s Group II	< 0.001	Highly Significant
Group I v/s Group III	<0.001	Highly Significant
Group II v/s Group III	< 0.001	Highly Significant

Table No. 3
Serum ALT level (Values Mean ± SD) in control and case groups

Group	No. of patients	ALT
Chronic Alcoholics with liver damage (Group I)	16	98.5 ± 86.94
Chronic Alcoholics without liver damage (Group II)	15	30.47 ± 6.16
Control (Non Alcoholics) (Group III)	10	19.7 ± 7.14

Table No. 4
Comparison of serum ALT level between cases and controls

Group	P value	Significance
Group I v/s Group II	<0.01	Significant
Group I v/s Group III	<0.025	Significant
Group II v/s Group III	< 0.001	Highly significant



Discussion:
Liver is the main target organ of ethanol toxicity. Chronic ethanol ingestion leads to an increase of lipid peroxidation products and a decrease of antioxidant factors. Likewise, oxidative stress has been related as the main factor implicated in alterations derived from its chronic consumption from, the central nervous system as well as from the peripheral nervous system[6,12].

In our study, we have observed that there was a significant lower level of antioxidant vitamin (Ascorbic acid) and increased activity of liver enzyme (ALT) in alcoholic patients with and without liver damage as compared to controls.

Alcohol causes damage to hepatocytes and deranges the liver functions. Alcohol causes free radical formation, which leads to oxidative stress[7]. Antioxidants vitamins neutralize the free radicals and therefore, used up in this process. Similar reports of decreased antioxidant vitamin levels in chronic alcoholics with liver disease were given in various studies[8 & 9]. These results show that in chronic alcoholism, the serum levels of antioxidant vitamins are significantly decreased in counteracting the damaging effects of free radicals.

Ethanol induces cytochrome P450 2E1, thereby causing generation of excess Reactive oxygen species, leading to the causation of oxidative stress[10]. On the other hand, acetaldehyde, the metabolic end product of oxidation of alcohol by alcohol dehydrogenase or by cytochromes causes the consumption of antioxidants[11].

Conclusion:
Oxidative stress is proposed to be critically involved in numerous diseases, including Alcoholic liver disease. The results of our study show that serum Ascorbic acid levels were significantly lower in all the cases; the decrease was more significant in Alcoholics with liver damage than in Alcoholics without liver damage. Mean serum ALT value was found significantly raised in Alcoholics with liver damage. The present study confirms that chronic alcohol use enhances the hepatic consumption of antioxidant vitamins caused by formation of reactive oxygen species induced by ethanol. Thus, Antioxidant vitamins play a prominent role in antioxidant defence during ethanol intoxication. Finally, our study suggests that mega doses of antioxidant vitamins with other drugs in patients with Alcoholic liver disease in the initial stage might prove effective in preventing or decreasing lipid accumulation and would protect the uninjured liver cells, repair the damaged cells and produce new hepatocytes. Thus far, results of experiments along these lines look promising and should be pursued further.

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