Protective Effects of vitamins E on Alcohol (Ethanol)-Induced Liver Injury in Mice

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ABSTRACT

Ethanol liver illness could be a major wellbeing issue around the world. One perspective of ethanol harmfulness that has gotten expanding consideration in later a long time is the part of free radical species within the etiology of liver injury. Vitamins E are cancer prevention agents that rummage at no cost radicals.

Aim: The study of hepatoprotective effects of Vitamins E on the liver damage

Methods: The effect of 20mg Vitamin E as food supplement administered for 21 days was studied on hepatic damage induced by ethanol (2.0ml/100g body weight per oral for 21 days, 40% v/v) in male mice.

Results:-. the level of serum aspartate transaminase (AST) and serum alanine transaminase (ALT) were greater in the animals nurtured with ethanol (group 2) ; and levels of these transaminases were absolutely lower in group 3 The impact of ethanol was smaller in group three mice . There was unimportant variance between the group 3 mice (P > 0.05) and control.

Keywords:

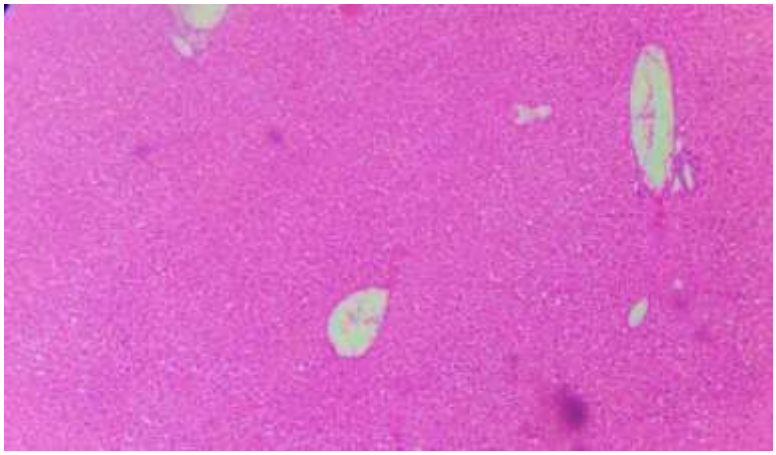
1.Introduction

Ethanol causes various metabolic modifications in the liver that are destructive. Its excessively long use causes steatosis, alcoholic, cirrhosis and hepatitis, Its exorbitantly lengthy use causes (more than 50-85 g/day for guys and above 25-45 g/day for females) could prompt a few sicknesses, for example, gastrointestinal harm, diabetes mellitus , pancreatitis, neurologic problems, alcoholic liver infection, and cancers (1,2) Amongst these illnesses, alcoholic liver illness has drawn in additional consideration because of its mortality and tall morbidity. Alcoholic liver infection is a significant sort of ongoing liver illness all through the world and can advance to liver malignant growth and liver cirrhosis. All of which bring about weight and volume adjustments. Constant liquor utilization can produce bountiful receptive oxygen species (ROS), such as hydroxyl radical (OH•), hydrogen peroxide (H2O2) and superoxide anion radical (O2−•). The ROS can act in response with greatest cell macromolecules and therefore cause cell harm(3) Accordingly, expanded ROS created by alcohol is remembered to play a part in the improvement of liquor prompted liver injury. Cell reinforcement catalysts incorporate superoxide dismutase (SOD), catalase (CAT), and nonenzymatic antioxidants comprise incorporate glutathione (GSH), ascorbate, vitamin E, ubiquinone and vitamin A (4-5) . As of late, numerous regular items which have

antioxidants were accounted for to have the impact of rummaging free revolutionaries and shielding liver from oxidative harm (6)

ROS reacts with cells, impairing nucleotide and protein synthesis. It also causes apoptosis and cell death, as well as interfering with cell repair systems. These pathways may alter the physical state of the plasma membrane, resulting in functional impairment (7).

Vitamin E is chain-breaking antioxidants (8-9), There are many structures, such as gamma, alpha and beta, tocotrienols and tocopherols;



nonetheless, the α-tocopherol structure is the most common and dynamic in human and tissue plasma(10-9). It has serves antioxidative activity as this can contribute a hydrogen particle from its chromanol towrad peroxyl radicals (11). vitamin E connects with other cell parts and may assist with encouraging the antioxidative enzyme. Vitamin E likewise expands the activities of other antioxidative compounds like glutathione and catalase peroxidase (12-9).

Notwithstanding its antioxidative capacities, vitamin E has other therapeutic impacts that can impede may prevent liver cirrhosis by modify inflammatory reaction and hepatic fibrosis, cell singling, cell multiplication and cell injury (13).

Studies have connected vitamin E supplementation with expanded adiponectin protein levels and mRNA, Adiponectin is a significant atom and works by smothering hepatic unsaturated fat blend and lessening aggravation in patients(14)

2.Materials and Methods

2.1Experimental animals:

In this investigation, male C57BL/6 mice weighing 25–30 grammes were used. A total of fifteen mice were separated into three groups, each with five mice. They were housed in a laboratory animal room with a 12-hour light/dark cycle, a temperature of 25°C, and a relative humidity of 40–60%. Group 1 was the saline control, whereas groups 2 and 3 were the experimental groups.

Treatment: **Group 1** For 21 days, mice were given 2ml/100g body weight of normal saline per mouth. On the 22nd day, they were sacrificed in a chloroform chamber. Taken Blood samples ranging from 1 to 2 mL were transferred to universal bottles. The liver was likewise cut up into little bits. A part of the tissue was fixed in 10% Formalin, while the rest was mixed. Blood and liver samples were subjected to biochemical and histological examinations.

Group 2: Hepatotoxicity was produced for 21 days by 2.0ml per 100g body weight, administering 40 percent ethanol v/v, orally (Vivek et al., 1994). They were sacrificed and handled as mentioned before on the 22nd day.

Group 3: In addition to the foregoing therapy, mice were given 20mg vitamin E orally for 21 days as a dietary supplement. They were sacrificed and handled as indicated above on the 22nd day.

2.2 Measurement of Biochemical Parameters in the Serum.

Lipid Peroxidation Levels into Liver are measured. The levels of lipid peroxidation into tissue of liver were tested using a commercial detection kit and the thiobarbituric acid (TBA)

technique, as directed by the manufacturer. Malondialdehyde (MDA) was utilized as the mention standard, and the findings were reported.

Histopathological Evaluation of the Liver c For histological investigation, liver tissue was embedded in paraffin, fixed in 4 percent paraformaldehyde, divided in 5 m width, and discolored with hematoxylineosin (H&E). A bright-field microscope was used to examine the histological alterations in stained liver slices. Antioxidant Power to Reduce Ferric (FRAP).

3. Results

3.1-Histopathological Group 1 (Control):

Figure 1 depicts the usual lobular architectural pattern of liver slice. Because of the low quantity of interstitial tissues, the lobulation is small and can only be determined by referring to the central vein. A reticulum is formed by the fusion of sinusoids at the periphery or the lobule. Hepatocytes were arranged in a labyrinth of anastomosing and branching perforated laminae, with sinusoidal gaps between **them. Hepatocyte cytoplasm was strongly eosinophilic, with conspicuous nuclei.**

Fig. 1 Representative histopathology of the liver of control group

Group 2 (Ethanol only): Although multiple major veins can be visible, the regular lobular architectural structure of the liver slice cannot be distinguished (Fig.2). Hepatocytes were found to be enlarged, with an enlargement of the sinusoidal space. Hepatocyte cytoplasm was hazy, poorly coloured (hydropic degeneration), and showed necrotic indications (Fig. 2).

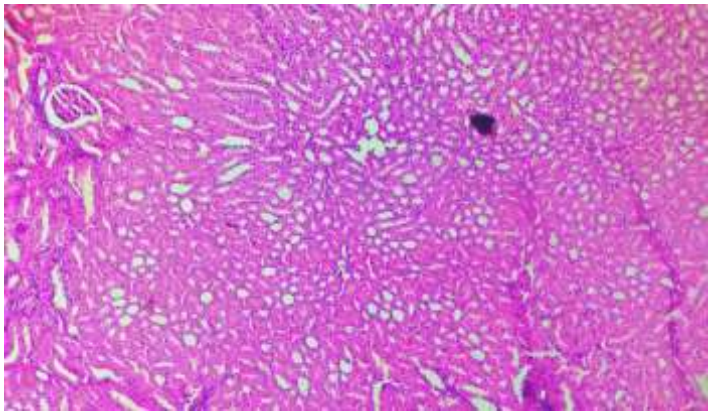


Figure 2: Histopathology of the liver of the Ethanol-Only group.

GROUP 3 (Ethanol + Vitamins E): The photomicrograph shows the vitamin-treated group's liver section, (Fig. 3) exhibited the marginal recapture though mild enlargement of the sinusoidal space and some necrosis.

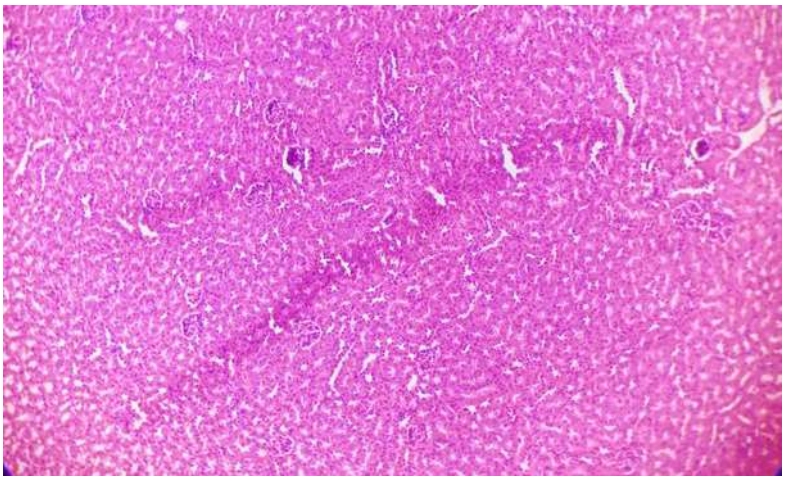


Fig. 3. Representative histopathology of the liver of Ethanol + Vitamins E group

3.2-Biochemical : The biochemical investigation results are shown into (Table 1). The regular levels of such biochemical markers for liver function tests are shown (n = 5). As previously stated, a statistical analysis of the results was performed and is displayed in the table. In comparison to the control (group 1), Elevations in values are usually proportional to the severity of liver injury. Table 1 shows that serum aspartate transaminase levels and serum alanine transaminase were greater in the ethanol-fed animals (group 2), and significantly lower in the ethanol-free animals (group 3). (P 0.05) is a statistically important difference. Group 3 had much lower levels of these transaminases. When compared to the control, total bilirubin levels into experimental group 2 were substantially higher (p 0.05). Ethanol had a lower effect on group 3 mice. The difference between the control and group 3 mice was not significant (P > 0.05). The level of triacylglycerol (TG) in serum was considerably (p 0.05) higher in group 2 than in the control group. The level of lipid peroxidation was dramatically reduced (p 0.05) when vitamin E was given.

Table 1: Effect of vitamins E on Biochemical parameters in mice subjected to Ethanol

Parameter	Control diet (n = 5)	Control diet +ethanol (n = 5)	Vitamin E + ethanol (n = 5)
AST, U/L (Mean ± SD)	108 ± 10.45	136.53 ± 19.94	110.85 ± 10.94
ALT, U/L (Mean ± SD)	44.5 ± 3.89	54.32 ± 4.76	461.32 ± 6.25
Total Bilirubin, mg/dl (Mean ± SD)	0.10 ± 0.10	0.18 ± 0.02	0.11 ± 0.02
Serum TG ,nmol/L(Mean ± SD)	0.5 ± 0.06	1.02 ± 0.12	0.62 ± 0.08
Lipid peroxidation (nmol MDA equivalent/mg prot)	0.69 ± 0.14	1.28 ± 0.22	0.73 ± 0.13

P<0.05. Values are; Mean ± S.D., n=5

4. Discussion

The pathological progression of alcohol convinced liver damage is linked to a number of variables and processes (15). ROS is a type of prooxidant that includes the superoxide radical, hydrogen peroxide and hydroxyl radical, all of which are produced naturally throughout metabolism. The antioxidant defense mechanism quickly eliminates normally generated ROS. Excessive buildup of reactive oxygen species (ROS) and cellular damage can occur as a result of alcoholic exposure. Excessive ROS buildup might lead to hepatocyte lipid peroxidation, which was previously thought to be the major mechanism

causing persistent alcohol tempted liver injury (16).

Increased total Bilirubin, ALT and AST levels in mice were indicative. The high bilirubin level indicates biliary blockage and haemolysis, which might be caused by a lack of blood flow to the hepatocytes. The slow increase in total bilirubin shows that hepatocyte deterioration is occurring; hence, necrosis may take a long time to develop(17).

The elevated levels of total bilirubin, AST, and ALT in serum were reduced after treatment with vitamins E. The restoration of aminotransferase activity in serum into usual implies hepatocyte revival and hepatic parenchymal repair; hence, vitamins E had the shielding impact against alcohol encouraged liver impairment. The findings backed with recent research that found vitamins E to be hepatoprotective against liver impairment caused by severe implementation and carbon tetrachloride (18). Furthermore, liver histological alterations in the current study verified chronic alcohol-induced liver damage

The result of ROS-induced lipid peroxidation accumulates in the alcohol-damaged liver and is an excellent indicator of overall oxidative stress(19). Alcohol substantially raised lipid peroxidation levels in the current investigation, which was comparable to a prior study that found higher lipid peroxidation in alcoholic patients(20). The amount of lipid peroxidation was lowered to a normal level after treatment with vitamin E, indicating that vitamin E has a strong protective impact against oxidative stress caused by alcohol.

Alcohol considerably increased lipid peroxidation levels in the current investigation. The degree of lipid peroxidation was lowered to a normal level after treatment with vitamin E, indicating that vitamin E has a considerable protective effect against alcohol-induced oxidative stress(21). The early illness of the liver, caused by persistent ethanol drinking, is hepatic steatosis, which is characterized by fat buildup (22).

Increased serum TG level variations verified the existence of alcohol-induced hepatic steatosis in this study. Vit E treatment dramatically reduced serum TG levels and histopathological alterations. Vitamin E treatment reduced blood TG levels and improved damaged histopathological alterations considerably.

5.1 Conclusion

Chronic alcohol intake may result in liver damage. Vitamin E is commonly accessible in the form of a beverage. In this work, we discovered that giving mice Vitamin E had hepatoprotective effects on alcohol-induced liver damage by lowering blood ALT, AST, TG, and total bilirubin levels, as well as lipid peroxidation. Vitamin E also displayed medium in vitro antioxidant capabilities, according to the in vitro antioxidant experiment. As a result, we believe the hepatoprotective benefits of Vitamin E are linked to its antioxidant properties. The findings suggested that Vitamin E might be used as a dietary supplement to prevent and cure liver impairment caused by persistent alcohol intake.

5.2 Recommendations

1- A daily intake of a specific kind of vitamin E may help to treat liver disease; 2- Avoid alcoholic beverages since they are extremely harmful to human health.

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