e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2024; 16(2); 1162-1165

Original Research Article

Selenium and Vitamin E Status in Patients with Alcoholic Cirrhosis

U.N. Priyadharshini*[1], D. Gayathri Priya[2], S. Prithiviraj[3]

[1]Associate Professor, Department of Biochemistry, Government Mohan Kumaramangalam Medical College, Salem, Tamil Nadu, India

[2]Associate Professor, Department of Biochemistry, Government Vellore Medical College, Vellore, Tamil Nadu, India

[3]Senior Consultant and Clinical Head, Department of Cardiac Anaesthesiology, Manipal Hospitals, Salem, Tamil Nadu, India

Received: 25-11-2023 / Revised: 23-12-2023 / Accepted: 26-01-2024

Corresponding Author: Dr. U.N. Priyadharshini

Conflict of interest: Nil

Abstract:

Background: Alcohol is the common cause of liver damage worldwide. There is a significant role of oxidative stress and lipid peroxidation in the pathogenesis of ethanol-induced liver injury. Ethanol consumption results in depletion of endogenous antioxidant capabilities. Heavy drinkers are deficient in Selenium, which is required for the activity of Glutathione Peroxidase and antioxidant vitamins A, C and E. This study aims at assessing the antioxidant status of the patients with alcoholic cirrhosis.

Objectives: The objective of this study is to estimate the serum levels of selenium and vitamin E in patients with alcoholic cirrhosis and compare the results with that of healthy individuals. Then find the correlation of selenium and vitamin E levels with serum bilirubin in alcoholic cirrhosis patients

Materials and Methods: This case control study included 50 healthy volunteers who served as control and 50 cases of alcoholic cirrhosis. The blood samples were analysed for selenium, vitamin E and Liver Function Tests viz. bilirubin, aspartate transaminase, alanine transaminase and albumin.

Results: The mean and standard deviation estimated for cases vs controls were Selenium (0.68 ± 0.05 vs 1.03 ± 0.04) and vitamin E (19 ± 0.7 vs 29.7 ± 1.2). Pearson correlation coefficient between selenium and vitamin E levels in alcoholic cirrhosis patients was 0.785 and it was found to be statistically significant.

Conclusion: Selenium and Vitamin E were significantly lower in cases when compared to controls. Supplementation of these antioxidants might be beneficial to the patients with alcoholic cirrhosis.

Keywords: Selenium, Vitamin E, Alcohol, Cirrhosis, Oxidative stress.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0) and the Budapest Open Access Initiative (http://www.budapestopenaccessinitiative.org/read), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Alcohol is consumed by a large percentage of world's population and a moderate proportion of them develop clinically significant liver disease. Alcohol is the common cause of liver damage worldwide. There is a significant role of oxidative stress and lipid peroxidation in the pathogenesis of ethanol-induced liver injury. Ethanol consumption results in depletion of endogenous antioxidant capabilities. Depletion of mitochondrial GSH (Reduced Glutathione) precedes and promotes the progression of alcoholic liver injury. Heavy drinkers are deficient in Selenium which is required for the activity of Glutathione Peroxidase and antioxidant vitamins A, C and E [1].

This study aims at assessing the antioxidant status of the patients with alcoholic cirrhosis by analyzing selenium and vitamin E levels and to assess the correlation between selenium and vitamin E levels with the severity of the disease.

Materials and Methods

This is an age and sex matched case-control study conducted after getting prior approval from the institutional ethical committee. The study population included two groups; 50 healthy volunteers who served as controls and 50 cases of alcoholic cirrhosis. The cases were recruited from Medical Gasteroenterology department.

Inclusion criteria

Patients with ethanol related decompensated liver disease with portal hypertension were included in the study. All patients had varying grades of oesophageal varices as identified by GI endoscopy.

Exclusion criteria

1. Nonalcoholic liver disease
2. Patients on vitamins and minerals supplementation during the past one year.

3. Patients with positive serology for Hepatitis B and C.
4. Patients with other coexisting medical or surgical illness like CAD, stroke, diabetes etc.

Sample collection

Random venous blood sample of 5 ml was collected. The serum was separated and analysed for Selenium, Vitamin E, Bilirubin, Aspartate transaminase, Alanine transaminase and Albumin.

For the determination of selenium, the sample was acid digested before analysis. The sample of 500µl was taken in a porcelain dish and 1.5 ml of nitric acid: perchloric acid mixture (ratio 5:1) was added and heated on a sand bath until complete ashing. The ashed sample was reconstituted with 2 ml of 0.2% nitric acid. The reconstituted sample was centrifuged for 10 minutes at 2500 rpm and the clear supernatant was transferred into another glass tube. The digested sample was submitted for analysis. Quantitative estimation of selenium was done by Graphite Furnace- Atomic Absorption Spectrophotometer with Zeeman background correction (Perkin Elmer Analyst 700) in the Department of Biochemistry, Shankara Nethralaya. Selenium in vapourized sample absorbs energy at wavelength of 196.3 nm. Absorbance at this wavelength is specific for selenium and is proportional to its concentration[2]. Reference interval of selenium for adults is 0.8 – 2 µmol/l Serum vitamin E was estimated by spectrophotometric method using bathophenanthroline and is based on the reducing property of vitamin E[3]. Alpha Tocopherol being a reducing agent can convert ferric ion into ferrous ion which can then combine with the chelating agent, Bathophenanthroline (BA) to produce pink coloured Ferrous- BA complex. The absorbance of this complex is measured at 536 nm which is proportional to the concentration of α Tocopherol in the reaction. Orthophosphoric acid is used to inhibit the interference caused by other reducing agents such as β carotene and glutathione and hence increases the specificity of the assay. Reference range of vitamin E for adults is 12 - 42 µmol/L.

Estimation of Total Bilirubin was done by Diazo Method, Aspartate transaminase and Alanine transaminase by Modified IFCC method and serum albumin by Bromocresol green dye binding method

Results and Statistical Analysis

The statistical analysis was done using the SPSS statistical software. The distribution of age among the control group and cases were as shown in table no. 1. Mean and standard deviation were estimated for each group (cases and controls). Mean values were compared using student independent 't' test (Table no. 2). Pearson's correlation analysis was done to find out the relationship between Selenium and Vitamin E (Table no. 3). The relationship is graphically represented by scatter diagram. Correlation analysis was also done for serum Bilirubin with selenium and vitamin E (Table no. 4).

Table 1: The distribution of age among the control group and cases

Group	N	Mean age (yrs)	SD	Student 't' test
Case	50	43.14	1.4	P=0.653
control	50	42.18	1.6	Not significant

Table 2: Mean Standard deviation and Test of significance of mean values between cases and cntrols.

Variable	Mean ± Standard deviation		P value
	Cases	Controls	
Bilirubin (µmol/L)	128.2±22	10.4±0.51	<0.001 Significant
AST (µkat/L)	1.6±0.25	0.37±0.01	<0.001Significant
ALT (µkat /L)	0.4±0.04	0.2±0.01	<0.001 Significant
Albumin (g/L)	28±3	52±0.6	<0.001 Significant
Selenium (µmol/L)	0.68±0.05	1.03±0.04	<0.001 Significant
Vitamin E (µmol/L)	19±0.7	29.7±1.2	<0.001 Significant

Table 3: Correlation of serum Selenium and Vitamin E in Alcoholic Cirrhosis patients

Variables	Pearson's correlation coefficient(r)	Significance (p)	Interpretation
Selenium vs Vitamin E	0.785	<0.0001	Significant and positive correlation

Scatter Diagram

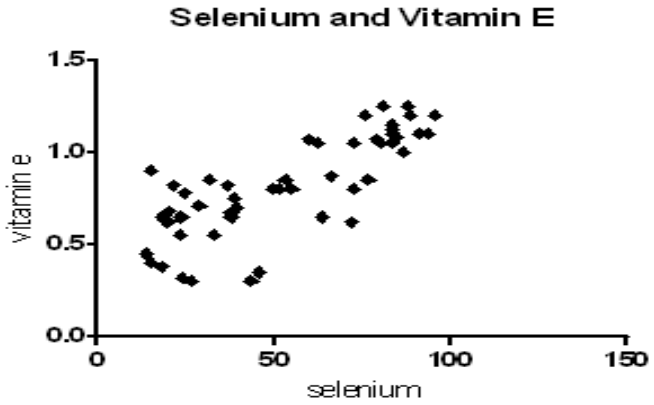

Figure 1:

Table 4: Correlation of Bilirubin with Selenium and Vitamin E in alcoholic cirrhosis patients

Variable	Pearson's correlation coefficient (r)	Significance (p)	Interpretation
Vitamin E vs Bilirubin	-0.529	<0.0001	Significant and Negative correlation
Selenium vs Bilirubin	-0.425	0.002	Significant and Negative correlation

Discussion

The present study demonstrates the defects in antioxidant status of patients with alcoholic cirrhosis. A decrease in plasma Selenium has been found previously by Johansson et al [5]. It may be due to low intake, absorption or metabolism in alcoholics. Plasma selenium was found to be decreased in alcoholic cirrhosis patients but not among alcoholics in abstinence. This shows that selenium deficient state in chronic alcoholics promotes the progression of liver cirrhosis. Sakena H Rashed et al has found the Vitamin E levels to be significantly reduced in patients with cirrhotic liver [6].

In the present study serum Selenium and Vitamin E levels were found to be significantly lower in alcoholic cirrhosis patients compared to the control group (Table no 2).The Karl Pearson's correlation coefficient between serum selenium and vitamin E showed a significant and positive correlation (Table no 3).

Serum Bilirubin shows a significant and negative correlation with selenium and vitamin E levels in cases. P Clot et al has found the markers of oxidative damage such as plasma lipid hydroperoxide and erythrocyte malondialdehyde to be 4-5 fold higher in alcohol intake of more than 100g/day [7].

This shows an altered redox status in these individuals with several derangements in the natural antioxidant defence mechanisms. Further validation studies are needed to evaluate the effects of selenium and vitamin E supplementation in patients with alcoholic liver disease in attenuating the progression of hepatitis to cirrhosis. The huge disease burden necessitates the urgent need for initiation of nutritional intervention trials in alcoholic hepatitis patients to find out the benefits in terms of reduction of morbidity and mortality. Although corner stone of therapy in alcoholic hepatitis is abstinence, there is increased risk of recidivism in patients who attempt to cut back but not stop drinking altogether [8]. And even if the patient becomes abstinent, the risk of developing cirrhosis is very high [9]. So nutritional intervention if proven beneficial, it may have a significant role in treatment of alcoholic hepatitis in future.

Conclusion

The present study shows decreased levels of antioxidant nutrients in patients with alcoholic cirrhosis. Selenium and vitamin E supplementation at an early stage of alcoholic liver disease may improve the outcome and long term prognosis in these patients

References

1. Thomas D Boyer, Michael P Manns, Arun J Sanyal, et al. Zakim & Boyer's Hepatology. A textbook of Liver Disease. 6th edition, Elsevier Saunders, 2012; 493-505.
2. Carl A Burtis, Edward R Ashwood , David E Bruns, et al. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 4th edition. Elsevier Saunders, 2006; 73-75:2253-2302
3. Nassema Mehbooali et al. A simple micro method for determination of plasma levels of alpha tocopherol in Pakistani normal adults. Pak.J.Pharm.Sci., October 2008; 21: 361-365.

4. Schumann G, Bonora R, Ceriotti F *et al*. IFCC Primary Reference Procedures for the Measurement of Catalytic Activity Concentrations of Enzymes at 37°C. Part 5. Reference Procedure for the Measurement of Catalytic Concentration of Aspartate Aminotransferase. Clin Chem Lab Med, 2002; 40:725–733.
5. U.Johansson et al. Selenium status in patients with liver cirrhosis and alcoholism. British Journal of Nutrition, 1986; 55: 227-233.
6. Sakena et al. Antioxidant status and some biochemical parameters in cirrhotic liver patients. National journal of Chemistry, 2010; 40: 742-751.
7. P Clot et al, Monitoring oxidative damage in patients with liver cirrhosis and different daily alcohol intake. Gut, 1994; 35: 1637-1643
8. Pendery ML, Maltzman IM, West LJ, et al. Controlled drinking by alcoholics? New findings and a reevaluation of a major affirmative study. Science, 1982; 217:169-175.
9. Galambos JT et al. Alcoholic hepatitis: its therapy and prognosis. Prog. Liver Dis, 1972; 4:567-588.