

A Study of Serum Zinc level in Cirrhosis of Liver

F Atia¹, N sultana², S Ahmed³, S Ferdousi², R sultana⁴, M Atiquzzaman¹

¹*Adhunik Sadar Hospital, Nilphamari*

²*Dept of Biochemistry, Dhaka Medical college, Dhaka*

³*Dept of Biochemistry, Popular Medical College, Dhaka*

⁴*Dept of Biochemistry, Delta Medical College, Dhaka*

ABSTRACT

Cirrhosis is a consequence of chronic liver diseases. Zinc is a micronutrient that plays an important role in the function of liver. This cross-sectional study was carried out in the Department of Biochemistry, Dhaka Medical College, from July 2010 to June 2011 to observe the association of serum zinc level with liver cirrhosis. A total of 100 adults, both males and females with age range of 18-60 years, of which 50 were healthy subjects and 50 adult hospitalised cirrhotic patients were selected purposively for the study according to selection criteria. Fasting serum zinc level was measured with atomic absorption spectrophotometer. Serum zinc level was found to be low in 72% patients. Mean \pm SD of serum zinc levels ($\mu\text{g/L}$) were 610.32 ± 169.60 and 827.66 ± 267.32 in cases and controls respectively. In cirrhotic patients serum zinc level was significantly lower than that of healthy controls ($P < 0.001$). Though, it is difficult to draw any definite conclusion from this study, because of reduced level serum of zinc found in cirrhotics, Zn may be supplemented to them with a hope of better treatment response.

Key words: Liver Cirrhosis, Zinc

Introduction

Cirrhosis, a consequence of chronic liver diseases, is characterized by replacement of liver tissues by fibrosis, scar tissues and regenerative nodules (lumps that occur as a result of a process in which damaged tissue is regenerated), leading to loss of liver function. It can occur at any age, has significant morbidity and is an important cause of premature death. World-wide, the most common causes of cirrhosis are chronic viral hepatitis, prolonged excessive alcohol consumption and fatty liver diseases¹.

Epidemiology of liver cirrhosis varies between gender, ethnic groups and geographical distribution. An earlier study reported the incidence of cirrhosis of liver in Bangladesh to be 2.6%, nutritional deficiency was considered to be the important etiological factor whereas alcoholism did not appear to have any significant role where 94.2% of the cases were non-

alcoholic². A recent study reported that Hepatitis B virus infection is responsible for 41% of cirrhosis of liver in Bangladesh³.

Zinc is the most essential trace element involved in various physiologic functions. It is required for tissue growth and repair. It has a critical role for the function of over 300 enzymes⁴. Zinc has a protective effect against fibrosis. It prevents cellular damage caused by oxidative stress⁵. Foods from animal sources especially meats, particularly organ meats contain the highest concentrations of zinc. Nearly two billions of peoples in the developing world are deficient in zinc⁶.

Zinc deficiency in cirrhotic patients appear to be due to anorexia and reduced intake of animal proteins, increase in cytokines or hormones that may affect zinc metabolism, increases in renal loss and poor absorption of nutrients due to

portal hypertension⁷. There is reduced synthesis of proteins in patients with liver cirrhosis. The metallothionein (MT) is an important zinc-binding protein (formed by liver), is involved in zinc metabolism, homeostasis and its release in number of oxidants, the released zinc then inhibit the activity of the enzymes involved in fibrogenesis (fibrosis) in the liver⁸. Impaired synthesis of this protein may decrease the availability of Zn.

Some of the clinical features of liver cirrhosis, such as testicular atrophy, loss of body hair, night blindness, poor wound healing, poor appetite, decreased taste and smell acuity, susceptibility to infections, enhanced sensitivity to drugs, and decreased neurocognitive performances, may be associated with Zn deficiency. In some cases, Zn supplementation was found to be beneficial to these patients⁹. The zinc supplementation also reduces the inflammation and contributes to faster resolution of inflammation.

Therefore keeping all such important points and views in mind, the aim of this study was to evaluate and assess the serum zinc level in patients with cirrhosis of liver.

Materials and Methods

This cross-sectional study was conducted in the Department of Biochemistry, Dhaka Medical College, from July 2010 to June 2011. For this study a total of 100 adults, both males and females with age range of 18 to 60 years, of which 50 were diagnosed patients of liver cirrhosis selected purposively from the Department of Medicine, Dhaka Medical College Hospital, Dhaka and 50 were healthy controls with no history of hepatitis. Patients with chronic debilitating diseases (such as renal failure, diabetes mellitus, malignancy), pregnancy, on zinc therapy or using hormonal drugs were excluded. Written informed consent was taken from each subject after explaining the purpose of the study. For serum zinc venous blood sample was collected in the morning

following 8 hours fasting. Serum zinc level was estimated in the Department of Biochemistry, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka using Atomic Absorption Spectrophotometer (Perkin Elmer- 3110). The normal range of serum zinc is 700-1500 $\mu\text{g/L}$. The value less than 700 $\mu\text{g/L}$ are considered as low. All data were recorded systematically in a preformed data collection sheet and processed using Statistical Package for Social Science (SPSS) windows version 17.0. Qualitative data were expressed as frequency and percentage, and were analyzed by Chi-square test (χ^2 test). Quantitative variables were expressed as mean \pm SD. Values of different parameters were compared to see the difference between two groups using Student's t-test. 95% confidence limit (p value < 0.05) was taken as the level of significance.

Results

Age and sex distribution of study subjects were shown in table-I. There was no statistically significant difference in age and sex between cases and controls.

Mean serum zinc level ($\mu\text{g/L}$) were 610.32 ± 169.60 and 827.66 ± 267.32 in cases and controls respectively (figure-1). A significant mean difference was found indicating cases had lower serum zinc concentration than that of controls ($P < 0.001$). Among the total of 50 cirrhotic patients 36 (72%) had low serum zinc level while remaining 14 (28%) patients had normal serum zinc level (figure-2)

Table I: Age and sex of study subjects

Groups	Age (yrs)		Sex	
	Mean \pm SD	Range	Male	Female
Controls (n=50)	34.40 \pm 9.91	18-56	31	28
Cases (n=50)	37.40 \pm 12.99	18-60	22	19
P-value	0.198		0.07	

For age unpaired t-test and for sex χ^2 -test was done

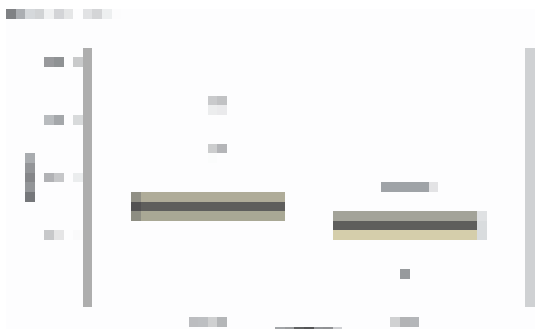


Figure 1: Comparison of serum zinc level between cases and controls.

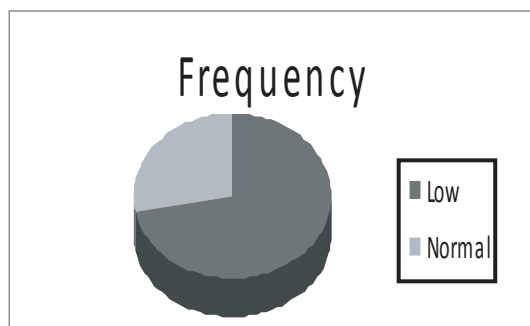


Figure 2: Distribution of cases in relation to serum zinc level.

Discussion

The magnitude of liver diseases in Bangladesh is progressively increasing. Hepatitis B and C viruses are the commonest culprit causing cirrhosis of liver in our country. Furthermore, consumption of adulterated foods, fruits, edible oils etc. may be causative factors for long-term inflammation of the liver leading to chronic liver diseases, cirrhosis and hepatocellular carcinoma in a vicious cycle. Excess and fatty food intake leads to fatty liver which may progress to cirrhosis in the long run. The current trend of fast food culture in young generation is one of the reasons of fatty liver, which is prevailing in our country³.

The liver is important for the regulation of zinc homeostasis, while zinc is necessary for proper liver function¹⁰. It should be noted that zinc level is usually related to the nutritional pattern of each population. Zinc deficiency is widespread in people living in developing countries like Bangladesh who consume mainly rice-based diets⁶.

In the present study, since there is no significant difference between cases and controls regarding gender and age distribution, these parameters could not lead to any bias in interpretation of zinc level in both the groups. The mean age (Mean \pm SD) of the cirrhotic patient was 48.72 ± 16.28 years which is similar to the study of Bhise et al¹¹.

In this study, 72% of cirrhotics suffered from hypozincemia which is in agreement with the study of Soomro et al. who evaluated the cirrhotic patients in a tertiary care hospital in Pakistan and found low level of zinc in 69% of cirrhotic patients⁸. Triwikatmani et al. found 66.7% and Stamoulis et al. found 65.3% of cirrhotic patients with hypozincemia^{12,10} which are consistent with our findings.

Our study showed a significantly lower plasma zinc level in cirrhotic patients (610.32 ± 169.60 $\mu\text{g/L}$) when compared with the healthy controls (827.66 ± 267.32 $\mu\text{g/L}$). The results were consistent with those reported by Triwikatmani et al.¹² and Yoshida et al.⁷ Poo et al. found mean serum zinc level 589.0 ± 161.0 $\mu\text{g/L}$ in cirrhotic patients from Mexico City. They showed that the levels were unexpectedly lower compared to those found in other countries¹³.

The exact percentage of zinc deficiency in this study may be higher. Some researcher assumed that serum zinc measurement in zinc deficiency is relatively less sensitive, because mild zinc deficiency can occur even with normal serum zinc concentration. The estimation of zinc concentration in granulocyte and lymphocyte give more sensitive information of marginal zinc deficiency compared to serum zinc concentration¹⁴. But we failed to that due our limited laboratory facilities.

From our small scale study, it is difficult to recommend routine serum zinc estimation and if found low, supplementation of Zn in cirrhotic patients. However, a large scale study considering other possible causes of hypozincemia and measuring Zn concentration in erythrocytes, granulocytes, lymphocytes and also urinary zinc excretion may be carried out to establish our findings.