Original Article

A Hospital Based Descriptive Study of Serum Magnesium Levels in Patients with Liver Cirrhosis and Healthy Controls

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ABSTRACT

Background: Liver cirrhosis is a growing health problem and mortality from this condition is increasing rapidly among both men and women. Cirrhosis rarely causes signs and symptoms in its early stages, but as liver function deteriorates, the signs and symptoms appear, including fatigue, nausea, unintended weight loss, jaundice, bleeding from the gastrointestinal tract, intense itching and swelling in the legs and abdomen. Micronutrients play a significant role in liver diseases. Magnesium is the second most abundant intracellular ion and the fourth most abundant cation in the body. The role of trace elements like magnesium in pathogenesis of liver cirrhosis and its complications is still not clearly understood, this study was conducted to evaluate magnesium levels in patients with liver cirrhosis and to assess their association with severity of disease.

Materials and Methods: This study was hospital-based case control observational study. The study was conducted at Central Lab, Department of Biochemistry, SMS Medical College & attached Hospitals, Jaipur. In this study, 92 cases of liver cirrhosis patients were taken and 92 sample size was taken in healthy controls.

Result: The mean serum magnesium levels of cases (1.13 ± 0.21) is lower as compared to controls (2.07 ± 0.27).

Conclusion: The study showed that, decreased magnesium levels in liver Cirrhotic patients as compared to controls which were statistically significant. The use of these simple and cost-effective biochemical parameter might prove to be biomarker in early detection of liver cirrhosis and may help to identify patients with liver cirrhosis.

Keywords: Magnesium (Mg), Liver Cirrhosis, Nonalcoholic fatty liver disease (NAFLD), Alcoholic liver disease.

INTRODUCTION

Liver cirrhosis is a growing health problem and mortality from this condition is increasing rapidly among both men and women[1]. It is a clinical condition in which fibrous replaces normal, healthy liver tissue. As the fibrosis replaces the normal liver tissue, it blocks the flow of blood through the organ and prevents the liver from functioning properly.[2]

Liver cirrhosis is the end stage of a variety of liver diseases, and is characterized by the disruption of liver structure, fibrosis, and the formation of regenerative nodules[3]. Cirrhosis is a chronic condition of liver in which diffused destruction and regeneration of hepatic parenchymal cells occur leading to diffused increase in connective tissue, resulting in disorganization of the lobular architecture. Cirrhosis rarely causes signs and symptoms in its early stages, but as liver function deteriorates, the signs and symptoms appear, including fatigue, nausea, unintended weight loss, jaundice, bleeding from the gastrointestinal tract, intense itching and swelling in the legs and abdomen.[4]

Although some patients with cirrhosis may have prolonged survival, they generally have a poor prognosis. Other causes of cirrhosis include chronic hepatitis B and D virus infection, autoimmune hepatitis, inherited disorders (e.g. α_1-antitrypsin deficiency, Wilson disease, hemochromatosis and galactosemia), non-alcoholic steatohepatitis, blocked bile ducts, drugs, toxins and infections. Nonalcoholic fatty liver disease (NAFLD), alcoholic liver disease, and hepatitis B and C infection are the major causes for liver cirrhosis and cancer.[5]

Micronutrients play a significant role in liver diseases. Magnesium is the second most abundant intracellular ion and the fourth most abundant cation in the body. It is widely distributed in almost all parts of the body and is highly compartmentalized, being present within the nucleus, cytoplasm, mitochondria and endoplasmic reticulum[6,7]. Approximately half of the total magnesium in the body is present in soft tissue, and the other half in bone. Less than 1% of the total body magnesium is present in blood. Nonetheless, the majority of our experimental information comes from determination of magnesium in serum and red blood cells.

The inactivation of some hormones also occurs in the liver. Due to this impairment, it results in higher serum levels of aldosterone, growth hormone and glucagon eventually enhance the excretion of urinary magnesium.[8]

Magnesium is an important cofactor involved in metabolic function. The main regulation site of magnesium is the kidneys where it can be absorbed, filtered and secreted. Every 100 mg increase in magnesium intake is associated with a 49% decrease in the risk of mortality due to all liver diseases.[9]

The role of trace elements like magnesium in pathogenesis of liver cirrhosis and its complications is still not clearly understood,[10] this study was conducted to evaluate magnesium levels in patients with liver cirrhosis and to assess their association with severity of disease.

MATERIALS AND METHODS

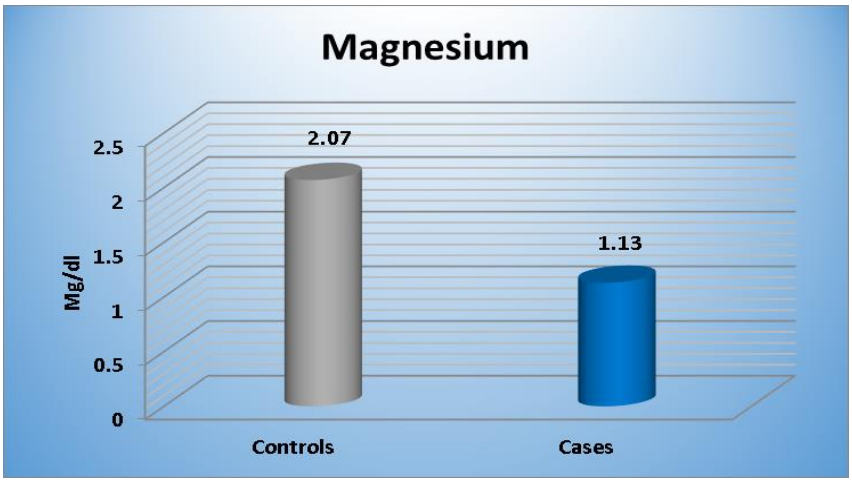
It is hospital-based case control observational study. This study was conducted at Central Lab, Department of Biochemistry, SMS Medical College & attached Hospitals, Jaipur. In this study, 92 cases of liver cirrhosis patients were taken and 92 sample size was taken in healthy controls. Serum levels of magnesium was assessed between cases and controls groups. The sample of venous blood will be collected under aseptic conditions after 12 to 14 hours fasting in plain vials. Plain vial left standing for 20-30 minutes. Then, samples were centrifuged at 3000 rpm for 10 mins to separate serum. Serum Magnesium were analyzed by Calmagite – EGTA Colorimetric method.

RESULTS

Table 1: Comparison of Mean S. Magnesium Levels between LIVER CIRRHOSIS Patients and controls.

Test/ Parameters	Controls	CASES	P-value
Serum Magnesium (mg/dl)	2.07 ± 0.27	1.13 ± 0.21	< 0.01 (S)

In the above table, it is shown that the mean serum magnesium levels of cases (1.13 ± 0.21) is lower as compared to controls (2.07 ± 0.27). However, P-value is significant (<0.01).



Graph 1: Comparison of Mean S. Magnesium Levels between LIVER CIRRHOSIS Patients and controls.

DISCUSSION

Magnesium plays a key role in regulating insulin action, insulin- mediated glucose uptake, and vascular tone. Low magnesium concentrations are associated with impaired glucose tolerance and increased risk for type П diabetes mellitus. It is currently unknown whether women with PCOS exhibit serum magnesium deficiency and its potential association with glycemic levels.

In our study, the mean serum magnesium levels in PCOS cases (1.88 ± 0.21 mg/dl) is less as compared to controls (2.09 ± 0.27 mg/dl) and this difference is statistically highly significant (p<0.001). Our study also showed significant negative correlation between fasting blood glucose and serum magnesium.

According to the study of Kauffman RP et al., magnesium levels did not correspond with age, BMI, waist circumference, glycemic levels, blood pressure or lipid levels in reproductive-age women with PCOS.[11] In a cross sectional study by Shariffi etal,. involving 103 PCOS patients, the risk of PCOS was 19 times higher in subjects with Mg deficiency than those with normal serum Mg concentrations (P ≤ 0.0001).[12] Although this study show that an association is known to exist between the low serum ionized magnesium (Mg^{2+}) and high ionized calcium to magnesium ratio with insulin resistance, cardiovascular problems, diabetes mellitus and hypertension.

CONCULSION

The present study was done to analyze the Serum Magnesium level in liver cirrhosis cases and controls and also to find out their correlation. The study showed that, decreased magnesium levels in liver Cirrhotic patients as compared to controls which were statistically significant. The use of these simple and cost-effective biochemical parameter might prove to be biomarker in early detection of liver cirrhosis and may help to identify patients with liver cirrhosis.

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