

# A study of serum magnesium level in alcoholic withdrawal patients

Rajesh Enadle

Professor, Department of Medicine, BKL Walawalkar Rural Medical College, Kasavwadi, Chiplun, Ratnagiri, Maharashtra, INDIA.

Email: [enadle@gmail.com](mailto:enadle@gmail.com)

## Abstract

**Introduction:** It has been shown that magnesium deficiency is primarily responsible for the pathogenesis of chronic alcoholism, complicated by delirium tremens. A total magnesium content of normal human is 12.4 mmol (25 mEq)/ kg of body wt. of this 1 percent is extra cellular, 31 percent is intracellular and 67 percent in bones. Serum Magnesium is reliable indicator of total body magnesium. Magnesium deficiency manifests as dysfunction of central Nervous System, neuromuscular transmission and muscular excitability. **Aims and Objectives:** To study the relationship between serum magnesium levels and severity of symptoms in chronic alcoholics, acute intoxication and acute withdrawal syndrome. **Methodology:** 100 patients of alcoholism were selected for this study. All the above patients fulfilled the criterion for alcoholism given by DSM IV. The normal range of serum magnesium level in our laboratory was 1.6 to 2.6 mEq/L. Statistical analysis done by Student's "t"-test. **Result:** Serum magnesium levels were lowest in Grade III patients. Grade II patients had slightly higher levels than Grade I. However, the differences were not significant ( $t=1.35$ , Diff = 1.99) ( $p<0.1$ ). The difference Grade II and Grade III patients was significant ( $t=2.5$ , Diff=70,) ( $p<0.050$ ). So also was the difference between Grade I and Grade II patients ( $t=2.03$ , Diff=85) ( $p<0.05$ ). Hence Grade III patients were found to have significantly lower magnesium levels compared to other 2 groups. Magnesium levels were lowered in all patients. Difference between the 3 groups was not significant ( $p>0.1$ ). **Conclusion:** Patients with mild and moderate symptoms do not have a significant difference between them in their serum magnesium levels. But compared with them, severely ill patients have a significantly depressed serum magnesium concentration.

**Keywords:** Hypomagnesaemia, Alcoholic Withdrawal Syndrome, Chronic Alcoholism.

## \*Address for Correspondence:

Dr. Rajesh Enadle, Professor, Department of Medicine, BKL Walawalkar Rural Medical College, Kasavwadi, Chiplun, Ratnagiri, Maharashtra, INDIA.

Email: [enadle@gmail.com](mailto:enadle@gmail.com)

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## INTRODUCTION

Magnesium is the second important cation after potassium and 4<sup>th</sup> most abundant intra cellular cation in humans. Magnesium is important co-factor in over 300 enzymatic, protein and nucleic acid synthesis. A total magnesium content of normal human is 12.4 mmol (25 mEq)/ kg of body wt. of this 1 percent is extra cellular, 31 percent is intracellular and 67 percent in bones. Serum Magnesium is reliable indicator of total body

magnesium.<sup>1</sup> Magnesium deficiency manifests as dysfunction of central Nervous System, neuromuscular transmission and muscular excitability. The causes of magnesium deficiency are many and most important of them are gastrointestinal, renal<sup>2</sup>, nutritional and endocrinal. Alcohol is single most important cause of magnesium deficiency in adults. In the first place alcoholic beverage are devoid of magnesium and major part of diet of an alcoholic consists of empty calories of alcohol and marginal nutrition. Alcoholics mal-absorption syndrome and steatorrhea, the intestinal absorption of magnesium decreases. The most important mechanism is that ethanol interferes with tubular reabsorption of magnesium and leads to development of hypomagnesaemia in alcoholics. In India about 10-15 percent population take alcohol and its use and abuse has been spreading in recent decades<sup>3</sup>. It has been shown that magnesium deficiency is primarily responsible for the pathogenesis of chronic alcoholism, complicated by delirium tremens<sup>4</sup>. Magnesium is necessary for a number

of different cellular enzymatic reactions involving trans phosphorylation in carbohydrate metabolism, protein synthesis, the and degradation of deoxyribonucleic acid and the activation of adenosine triphosphate<sup>5</sup>. Commonly reported signs and symptoms are hypokalemia and hypocalcaemia which contributes to the clinical picture- Lethargy, confusion, muscle twitching, tremors, muscle weakness, fasciculation, positive Chovestek's Sign<sup>6</sup>, tetany, parasthesias, cardiac arrhythmias, apathy, depression, aggressiveness. And some rarely reported signs and symptoms:<sup>7</sup> Vertigo, nystagmus, ataxia, choreiform, athetoid movement, seizures, delirium tremens, coma. Hypomagnesaemia associated with chronic alcoholism Hirshfelder and Haury<sup>8</sup> were amongst the first to describe magnesium deficiency in man. In their paper published in 1934 they showed the relation of hypomagnesaemia to muscular twitching, tremors and convulsions. In 1941, delirium tremens was treated empirically with magnesium sulphate given parentally with success<sup>9</sup>.

## MATERIAL AND METHODS

100 patients of alcoholism were selected for this study. All the above patients fulfilled the criterion for alcoholism given by DSM IV. Patients of alcoholism with Clinical picture of cirrhosis of liver with ascites and other signs of portal hypertension, Patient with hepatic encephalopathy, Patients with deranged liver function tests with high suspension of hepatic precoma, Patient with other major systematic illnesses like acute myocardial infarction, diseases of central nervous system, diabetes mellitus, other endocrine disease of central nervous system, diabetes mellitus, other endocrine disease and those on diuretic therapy were not included in this study. Serum magnesium values determined by atomic absorption spectrophotometry. The normal range of serum magnesium level in our laboratory was 1.6 to 2.6 mEq/L, Statistical analysis done by Student's "t"-test.

## RESULTS

**Table 1:** Comparison of serum magnesium levels between grades of Alcoholism in Patients

| Severity Alcoholism | Mean mEq/L | SD   | Difference |
|---------------------|------------|------|------------|
| Grade I             | 1.54       | 0.19 | p>0.1      |
| Grade II            | 1.58       | 0.21 |            |
| Grade III           | 1.42       | 0.24 | p>0.5      |

**Grade I:** Chronic alcoholic with good nutrition

**Grade II:** Chronic alcoholic with malnutrition.

**Grade III:** Chronic alcoholic with abuse and withdrawal.

Serum magnesium levels were lowest in Grade III patients. Grade II patients had slightly higher levels than Grade I. However, the differences were not significant

( $t=1.35$ , Diff =1.99) ( $p<0.1$ ). the difference Grade II and Grade III patients was significant ( $t=2.5$ , Diff=70,) ( $p<0.050$ ). so also was the difference between Grade I and Grade II patients ( $t=2.03$ , Diff=85) ( $p<0.05$ ). Hence Grade III patients were found to have significantly lower magnesium levels compared to other 2 groups.

**Table 2:** Serum magnesium levels and period of alcohol consumption

| Period of alcohol consumption | Serum Magnesium Mean mg% | SD   |
|-------------------------------|--------------------------|------|
| 2-5                           | 1.56                     | 0.23 |
| 6-10                          | 1.52                     | 0.24 |
| More than 10                  | 1.55                     | 0.20 |

Magnesium levels were lowered in all patients. Difference between the 3 groups was not significant ( $p>0.1$ ).

## DISCUSSION

The patients were divided into 3 grades as shown in table no.4 To grade I Chronic alcoholic with nutrition. 40 patients belonged to grade I. chronic alcoholic with malnutrition to grade II. 35 patients belonged to this group. Chronic alcoholic with abuse and withdrawal were in grade III. There were 30 patients in grade III (Table). The serum magnesium was determined in all cases by calorimetric method using thymol blue reagent<sup>14</sup>. Thus the first conclusion was that the serum magnesium is significantly lowered in patients of chronic alcoholism. This is in agreement with the work of Flink *et al*<sup>10,11,12,13,14</sup> Who is been pioneer in this field similar results were obtained by Lim P and Jacob E<sup>14</sup>. Next, serum magnesium was assessed separately in the three different grades of patients. No statistically significant difference was found between grade I and II ( $p>0.1$ ) (Table- 4) moreover serum magnesium was slightly higher (1.58mg%) in grade II compared grade I (1.54mg%). However serum magnesium levels were significantly lower in grade III parties. The lower value of 1.42 mg% in this group was significantly compared to both grade I ( $p<0.05$ ) as well as grade II ( $p<0.05$ ). In the world literature not much work has accumulated to show the relation, if any, between serum magnesium levels and the severity of the symptoms. Flink *et al*<sup>15</sup>. Commented upon the correlation between the severity of illness and the magnesium concentration but did not find the difference to be statistically significant. This is not surprising considering the fact that magnesium is directly concerned with the function of the central nervous system<sup>16</sup>.

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