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Levels of serum magnesium in normal and diseased person -A comparative study

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Abstract
The Magnesium is the fourth most abundant cation in the body, second most abundant cation of the intracellular fluid and is known to be intimately associated with a variety of metabolic events. The present study presents the data on level serum magnesium in normal and diseased persons (Renal Failure). The Results reveals that the mean serum magnesium levels are found to be higher in cases of Renal Failure in comparison with the control (normal) group, which may due to different pathological and malfunctioning of different systems.

Keywords: Serum Magnesium, Renal Failure

1. Introduction

Magnesium is one of the most vital elements in biologic systems. In the plant world, it is the key element of chlorophyll. In the animal world, it is essential for many vital enzyme systems among which are the activation of membrane bound adenosine triphosphatase. This enzyme system deals with energy production through oxidative phosphorylation and with distribution of sodium and potassium across the cell membrane.

Metabolic balance studies have suggested that an intake of 8.3 – 12.5 amolz daily equivalent to 0.15 – 0.17 amol/ kg is required to maintain magnesium balance mentioned.(1).

Magnesium has atomic number 12. Its atomic mass is 24.31 and common oxidation number is +2(2). The mineral magnesium is the second most abundant intracellular action and is involved in several important biochemical reactions. Magnesium is found in most foods, but in varying concentrations. Leafy vegetables, nuts, whole grains, fruits, and legumes are considered as foods with high-magnesium concentrations (3^3). The dietary recommendation (Recommended Dietary Allowances) for magnesium is 400 to 420 mg daily for adult men and 310 to 320mg daily for adult women. However, consumption is far below this recommendation, and the high prevalence of this deficiency has been associated to several chronic diseases
(4).

Magnesium is a unique calcium antagonist as it can act on most types of calcium channels in vascular smooth muscle and as such would be expected to decrease intracellular calcium. One major effect of decreased intracellular calcium would be inactivation of calmodulin -dependent myosin light chain kinase activity and decreased contraction, causing arterial relaxation that may subsequently lower peripheral and cerebral vascular resistance, relieve vasospasm, and decrease arterial blood pressure (5). It is known that magnesium has antiarrhythmic effect and can influence blood pressure levels by modulating vascular tone. Changes in extracellular magnesium content are able to modify the production and release of nitric oxide (NO), resulting in the alteration of arterial smooth muscle tone by affecting calcium concentrations(2).

2. Materials and methods

The patients admitted in WAMA Hospital, Hyderabad and few outpatient cases of who were clinically investigated and pathologically proved have been selected for present study of serum magnesium estimation. The present study includes the following 20 normal individuals are studied to serve as controls and 10

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cases of Renal Failure are studied in the present case.

2.1 Estimation of serum magnesium

Xylidyl Blue method [92] on semi auto analyzer Micro lab 300.

At alkaline pH magnesium reacts with xylidy1 blue and produces a chelating red colored compound. The red increasing color is proportional to magnesium concentration.

Reagent 1: Magnesium reagent: A solution containing buffer (ph 11.2 at 25^0C), 0.14 mmol/L xylidy1 blue-1,0.1 mmo1/LEGTA.

Magnesium Standard: A solution containing 1.025mm/L (2.5mg/dl) magnesium and a preservative.

The reagent is for *in vitro* diagnostic use only.

Do not pipette by mouth. Avoid contact with skin and clothing.

R1/RT: Corrosive(C): R35: Causes severe burns.

Sample used is Serum.

The reagent is provided in a ready to use format.

The reagent is stable, opened or unopened, at 18-26^0 C until the expiry date mentioned on the label.

2.2 Automated parameters

Wavelength	505nm (450-550)
Measurement	End Point
Cuvette	1cm light path
Reaction Temperature	Room Temperature
Reaction Type	Increasing
Measurement	Against Reagent Blank
Sample / Reagent Ratio	1:100
Incubation	05 minutes
Low Normal	1.8 mg/dl (0.73mmol/L)
High Normal	2.6 mg/dl(1.06 mmol/L)
Linearity	5.0 mg/dl (2.05 mmol/L)

2.3 Manual procedure

Pipette into test tubes

	Blank	Standard	Sample
Sample	-	-	10ul
Standard	-	10ul	-
Reagent	1000ul	1000ul	1000ul

Mix and incubate for 5 minutes at room temperature. Measure absorbance of sample (AT) and standard (AS) against reagent Blank at 505 nm. The color is stable for 30 minutes at room temperature.

2.4 Calculation

Magnesim (mg/dl)= AT/AS x Concentration of Standard

2.5 Reference interval

Serum: 1.8 – 2.6 mg/dl

3. Results and discussion

It is evident from Table I that serum magnesium level in case of persons suffering from Renal Failure in high in comparison with that of control (normal) group.

Table I: Serum Magnesium values in normal (20 cases) and in case of diseased persons (10 cases)

Group	Serum Magnesium in mEq/L
1.Control group (normal	
Range	1.43 – 2.20
Mean	1.81
S.D.I. ±	0.19
2.Renal Failure	
Range	2.26 – 5.48
Mean	3.87
S.D.I. ±	0.80
P.Value	<0.001

In 10 case of Renal Failure the mean magnesium value is found to be 3.87 mEq/L than the control (Normal), mean value of 1.81 mEq/L; the study demonstrates that in case of Renal Failure, the value of serum magnesium is higher than the control group, which may due to different pathological and malfunctioning of different systems. Renal excretion of magnesium is increased during diseases induced by glucose, ammonium chloride, Furosemide and other organic substances. In 10 subjects with renal failure the mean serum magnesium level is found to be 3.87 mEq/L as compared to the observed value of 1.81 mEq/L which is statistically significant (P<0.001) Renal damage complete or partial which ultimately interferes with excretion and re-absorption of magnesium might be responsible for retention of magnesium and consequent higher value in the blood. The renal mechanism for excretion of magnesium is very important in regulating plasma level of magnesium. The renal insufficiency sets a new level of control of gradient across the cell membrane which results in the rise of serum magnesium level. Hypo-proteinamia and consequent changes in the shifting of fluid also plays an important role in the increase of serum magnesium level.

Conflict of interest

The author's declares none.

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