Original article:

Study of correlation between hypomagnesemia with the clinical and other biochemical parameters on admission in patients admitted to a Medical Intensive Care unit

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Abstract:

Introduction: Potassium is the most common cation present intracellularly, next is magnesium[1]. Total body magnesium is about 25gm, sixty percentage of that is combined with calcium to form a complex in the bone[2]. It serves as a co factor in more than 300 enzymatic reactions involving nucleic acid synthesis.

Methodology: The cross sectional study was conducted in patients admitted in MICU of AARUPADAI Veedu Medical College, Kirumampakkam. After obtaining consent a detailed history, clinical examination and lab investigations was done as per the usual proforma.

Results: The mean and SD of Hypomagnesemia patients was 9±1.095. The mean and SD of normomagnesemia patients was 5.137±0.789. P value calculated by the Levene's test of equality of variance is 0.002 and is statistically significant. The mean APACHE II score for hypomagnesemic patients was 16.32 with standard deviation of 6.498. The standard error of the mean was 0.203. ''p'' value was not statistically significant and APACHE II score level was not   significantly different between patients with low magnesium level and   normal magnesium level. In the study conducted by Limaye et al[45], the mean.

Conclusion: This study emphasizes the importance of measuring serum magnesium levels at the time of admission - in addition to other parameters- in all patients admitted to the ICU.

Introduction:

Potassium is the most common cation present intracellularly, next is magnesium[1]. Total body magnesium is about 25gm, sixty percentage of that is combined with calcium to form a complex in the bone[2]. It serves as a co factor in more than 300 enzymatic reactions involving nucleic acid synthesis. It is also involved in process such as: receptor binding for hormone synthesis, gating of the calcium ion channel; ion flux across membrane; muscle contraction; cardiac excitability and neurotransmitter release. Incidence of hypomagnesemia in critically ill patients varied from 20% to 60% in various studies across the world[3]. It is the most common under diagnosed electrolyte disorder in critically ill patients. Low magnesium can be used as a key to predict the severity and outcome of the critically ill patients[4]. Thus it can be useful as a prognostic marker supplementing other compounds, electrolytes which are routinely measured in the critical care units.

Though we have confined our study to assess severity of the illness and a few other electrolyte disturbances, further studies can be done to observe the benefits of magnesium correction or supplementation.

Methodology:

The cross sectional study was conducted in patients admitted in MICU of AARUPADAI Veedu Medical College, Kirumampakkam. After obtaining consent a detailed history, clinical examination and lab investigations was done as per the usual proforma.

The following criteria was applied to select the patients in the study group.

INCLUSION CRITERIA

All patients more than 18 years of age admitted in the medical intensive care unit.

EXCLUSION CRITERIA

Chronic alcoholics

Patients who received blood transfusion prior to admission

Patients on magnesium sulfate, diuretics and aminoglycosides, cisplatin or amphotericin B .

The study included a total number of 60 cases of patients. Out of which 31 patients had Hypomagnesemia and 29 patients had Normomagnesemia.

Distribution by Magnesium Level

Table No. 1 Distribution by Magnesium Level

Total no. of patients	Hypomagnesemia	Normal magnesium
60	31	29
Frequency	51.6%	48.4%

Out of 60 patients 31 patients were found to have hypomagnesemia and the remaining 29 patients were found to have normal magnesium.

The following table shows the distribution of patients according to their age. It shows that the majority of patients are between 40-60 years old (61.3%) in Hypomagnesemia and majority of patients are between 40-60 years in Normomagnesemia group (86.2%).

Table No. 2 Distribution by Age in Years

Age in Years	Hypomagnesemia		Normomagnesemia		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
<20	0	0%	0	0%	0	0%
20-40	5	16.1%	4	13.8%	9	15%
40-60	19	61.3%	23	86.2%	42	70%
>60	7	22.6%	2	6.9%	9	15%
Total	31	100%	29	100%	60	100%

$X^2 = 3.2067$ 'p' Value $= 0.2021$ Not Significant

The following table shows the distribution of patients according to their Gender. It shows that the majority of patients were males (67.7%) in Hypomagnesemia and majority of patients were males in Normomagnesemia group (79.3%).

31.7% of the patients included in our study were treated for sepsis,

13.3%of the patients had CAD, 16.7 % had pneumonia,

11.7% had CVA other cases were COPD, cirrhosis, OPC poisoning.

Table No. 3 Comparison of two groups according to APACHE II

	Hypomagnesemia		Normomagnesemia		Total		't' Value	'p' Value
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation		
APACHE II score	16.322	6.498	14.931	6.397	15.65	6.433	0.835	0.203 (NS)

(S – Significant, NS – Not Significant)

The above table shows the Comparison of two groups according to APACHE II score. The 'p' value of APACHE II was 0.203 which is greater than 0.05 shows that there no significant difference between these two groups in terms of APACHE II.

It shows that 73.6% of hypomagnesemia patients having sepsis.

The following table shows the distribution of patients according to Need for Ventilation. It shows that the majority of patients need ventilation (64.5%) in Hypomagnesemia and majority of patients didn't need ventilation in Normomagnesemia group (62.1%).

Table No. 4 Distribution by Need for Mechanical Ventilation

Need for Ventilation	Hypomagnesemia		Normomagnesemia		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
No	11	35.5%	18	62.1%	29	48.3%
Yes	20	64.5%	11	37.9%	31	51.7%
Total	31	100%	29	100%	60	100%

$X^2 = 4.24$ 'p' Value = 0.039   Significant

Discussion

The mean and SD of Hypomagnesemia patients was 9±1.095. The mean and SD of normomagnesemia patients was 5.137±0.789. P value calculated by the Levene's test of equality of variance is 0.002 and is statistically significant.

The mean APACHE II score for hypomagnesemic patients was 16.32 with standard deviation of 6.498. The standard error of the mean was 0.203. ''p'' value was not statistically significant and APACHE II score level was not significantly different between patients with low magnesium level and normal magnesium level. In the study conducted by Limaye et al[45], the mean.

APACHE score was 14.5+/-8.2 in the hypomagnesemic patients and was not significantly different from normomagnesemic patients. The APACHE score was also not significantly in the studies conducted by Demircan

et al[4]. But in the study conducted by Safavi et al[44] and SS Gupta et al [5] the APACHE score was significantly higher in the patients with hypomagnesemia than the normomagnesemic patients.

It shows that 91.7% of the diabetic patients had low magnesium level. And 41.7 % of non-diabetics had hypomagnesemia. P value calculated by chi-square test was 0.001.Thus incidence of hypomagnesemia is significantly higher in patients with diabetes mellitus. Limaye et al[4] and Safavi et al[44] and arundhati et al[53] also showed a similar result . 73.6 % of the patients with sepsis had hypomagnesemia. 'p' value was 0.02 statistically significant. sepsis was supposedly more common in hypomagnesemic patients in the study by Limaye et al[45] and Demircan et al[6]. 68% of the patients with low potassium level had low magnesium level on admission. 40% of the patients with normal or high potassium had lowmagnesium level on admission P value calculated by Chi-square test was 0.032 and is significant. Thus in our study the relation between hypocalcemia and hypomagnesemia was not statistically significant. A study made by Peivandi et al[57] also showed similar results.

48.8% of the hypomagnesemic patients had low albumin level. 57.9% of the normomagnesemic patients had low serum albumin.. P value calculated by Chi-square test is 0.511. Thus incidence of hypoalbuminemia is not significantly different between patients with low and normal magnesium level. Albumin level has been so far only studied in the Limaye et al[8] study and low levels was found significantly higher in patients with hypomagnesemia.

Conclusion:

This study emphasizes the importance of measuring serum magnesium levels at the time of admission - in addition to other parameters- in all patients admitted to the ICU.

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