ORIGINAL RESEARCH PAPER

General Medicine

CORRELATION OF SERUM MAGNESIUM LEVELS WITH CLINICAL OUTOCOMES IN CRITICALLY ILL PATIENTS ADMITTED TO MEDICAL ICU

KEY WORDS: ICU, hypomagnesemia, ATP, mortality.

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ABSTRACT

Hypomagnesemia is one the most frequently underdiagnosed electrolyte disorders, especially in critically ill patients. It is a critical ion essential for life , serving as a cofactor for more than 300 enzymatic reactions, with involvement in the formation of ATP. An estimated 20 to 65 % patients with critical illnesses admitted to medical Intensive Care units (ICU) develop hypomagnesemia, thus emphasizing the importance of its detection and management. This was a prospective observational study. A total of 50 critically ill patients who were admitted to the Intensive Care units(ICU) under the department of general medicine and who fulfilled inclusion and exclusion criteria were studied. Serum magnesium levels along with other investigations were done within first 24 hours of admission. It was found in the study that 30 out of 50 such patients (i.e.60%) had hypomagnesemia, 15 out of 50 patients(i.e. 30%) had normomagnesemia and 5 out of 50 patients (i.e. 10%) had hypermagnesemia. The patients with hypomagnesemia compared with normomagnesemia, had a higher mortality rate (43. 33% vs 13.33). Thus, Hypomagnesemia was seen to be associated with a higher mortality rate in critically ill patients admitted in medical ICU, compared to patients with normal magnesium levels.

INTRODUCTION:

Magnesium is the fourth most abundant cation in human body and the second most intracellular cation after potassium. Abnormalities of magnesium levels, such as hypomagnesemia, can result in disturbances in nearly every organ system and can cause potentially fatal complications (eg- ventricular arrhythmia, coronary artery vasospasm, sudden death). Despite the well-recognized importance of magnesium, low and high levels have been documented in ill patients[1], as a result of which, magnesium has occasionally been called the "forgotten cation[2,3]. The total body magnesium content of an average adult is 25 g, or 1000 mmol. Approximately 60% of the body's magnesium is present in bone, 20% is in muscle, and another 20% is in soft tissue and the liver. Normal plasma magnesium concentration is 1.7-2.4 mg/dL (0.7-0.9 mmol, or 1.4-1.8 mEq/L)[4].In various studies, Hypomagnesemia has been linked to poor outcome in several different patient populations, a study of 21,534 patients on maintenance dialysis, it was found that patients with the lowest serum magnesium levels (<1.30 mEq/L) were at highest risk for death[5]. Hypomagnesemia is a common development in critically ill sepsis patients, and indicates a poor prognosis. Although evidence is derived largely from observational studies, it shows a significant association between hypomagnesemia with increased need for mechanical ventilation, prolonged intensive care unit stays, and increased mortality[6]. In a Mayo Clinic review of 65,974 hospitalized adult patients, hypomagnesemia on admission was associated with increased in-hospital mortality. Death rates were found to be 2.2% in patients with magnesium levels of 1.5-1.69 mg/dl and 2.4% in those with levels below 1.5 mg/dl; by comparison, mortality in patients with levels of 1.7-1.89 mg/dl were 1.8% [7]. Another study by Rubeiz GJ et al[8] found that in a total of 381 consecutive acutely ill medical patients, the normo and hypomagnesemic groups had comparable APACHE II scores but mortality rates were twice in hypomagnesemic than the normomagnesemic patients. A retrospective study conducted on 100 critically ill patients found that development of hypomagnesemia in ICU was associated with a guarded SOFA score, more need for ventilator (58.6% vs. 41.4%) and longer duration of mechanical ventilation(7.2 vs. 4.7 days)[9]. A recent study evaluating hospitalized AIDS patients found that hypomagnesemia is a risk factor for nonrecovery of renal function and for in- hospital mortality. The risks for nonrecovery of renal function and for death were 6.94 and 6.92 times greater, respectively, for patients with hypomagnesemia[10]. In an observational study Indian conducted by Limaye et al[11] on hypomagnesemia in critically ill medical patients, it was found that on admission to MICU, 52% had hypomagnesemia. Patients with hypomagnesemia had higher mortality rates (57.7% vs. 31.7%), more frequent need for ventilatory support (73% vs. 53%), longer duration of mechanical ventilation (4.27 vs. 2.15 days), more frequently had sepsis (38% vs. 19%), hypocalcemia (69% vs. 50%) and hypoalbuminemia (80.76% vs. 70.8%). Patients with diabetes mellitus had hypomagnesemia more frequently (27% vs. 14%), although many studies have been done previously showing varied prevalence and increased association with mortality and morbidity in patients with hypomagnesemia, there is a definite lack of studies in central India, thus this particular study was done to correlate serum magnesium levels with clinical outocmes in critically ill patients admitted to medical ICU

METHODS AND MATERIALS

A prospective observational study was conducted in the medical ICU of a tertiary care hospital after approval from the medical ethics committee, 50 patients with critical illnesses requiring intensive care for more than at least 2 days with age more than 12 years were included after a detailed informed consent. Patients receiving magnesium supplementation prior to transfer to ICU were excluded from this study. A blood sample was collected for estimation of serum total magnesium level on the day of admission to ICU. A detailed history and through clinical examination were performed in every patient. Patients were followed up to assess their mortality and morbidity in the form of total ICU and hospital stay. Patients were classified into two groups according to their initial serum total magnesium level: hypomagnesemia and normomagnesemia.

OBSERVATION AND RESULTS:

Table no 1: AGE WISE DISTRIBUTION OF PATIENTS

S No	Age	No. of cases	Normomagnesemia	Hypomagnesaemia	Hypermagnesaemia
1	10-20	2	1	1	0
2	21-30	2	1	1	1
3	31-40	6	0	5	3
4	41-50	8	6	3	0
5	51-60	15	6	10	0
6	61-70	11	2	8	1
7	71-80	2	1	2	0
		Total	15	30	5

The above table shows proportion of hypomagnesemia (60%), hypermagnesemia(10%), normomagnesemia (30%).

Table 2: SHOWING NORMAL SERUM MAGNESIUM LEVEL WITH OUTCOME IN CASE 0F CRITICALLY ILL PATIENTS.

S.no	Case no.	Normomagnesemia	Outcome
1	2	1.8	2
2	3	1.8	2
3	5	1.9	2
4	8	1.7	1
5	11	1.8	2
6	13	1.8	2
7	14	1.8	2
8	28	1.8	1
9	30	1.8	2
10	39	1.9	2
11	42	1.9	2
12	44	1.8	2
13	45	1.9	2
14	47	1.8	2
15	49	1.9	2
	Mean	1.82667	13.33%

Above table shows mean serum magnesium level is 1.82667 in normomagnesemic patients and outcome in form of death is-13.33%.In above tables on outcome, 2 indicate discharge and 1 indicates death.

TABLE 3: SHOWING LOW SERUM MAGNESIUM LEVEL WITH OUTCOME IN CASE 0F CRITICALLY ILL PATIENTS.

s.no.	Case no.	Hypomagnesaemia	Outcome(DEATH)
1	6	0.8	1
2	7	0.9	1
3	9	1.4	1
4	10	1	2
5	12	1.2	2
6	15	1.1	1
7	16	1.2	1
8	18	1.1	2
9	19	1	1
10	20	1.08	2
11	21	1.03	2
12	22	1.08	1
13	23	1.6	2
14	24	0.9	2
15	25	0.8	2
16	26	1.2	2
17	27	1.6	2
18	29	0.7	2
19	31	0.9	2
20	32	0.9	1
21	33	0.4	1
22	34	1.1	2
23	35	1	2
24	36	0.9	1
25	37	1.3	1
26	38	1.08	2
27	40	1.6	2
28	41	0.3	2
29	48	0.8	1
30	50	1.3	1
		MEAN-1.04233	43.33%

Above table shows mean serum magnesium level is 1.04233 in hypomagnesemic patients and outcome in form of death is-43.33%. In above tables on outcome, 2 indicate discharge and 1 indicates death.

CONCLUSION:

Thus , after making a clinical correlation of serum magnesium levels with outcome in critically ill patients admitted to medical ICU, it was concluded that hypomagnesemia was associated with a higher mortality rates(43.3 %) as compared to normomagnesemia(13.3%), this study highlights the importance of monitoring serum magnesium levels in ICU patients and as a potential measure to reduce mortality by correction of hypomagnesemia which would require more studies in future.

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