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Prevalence of hypomagnesemia in critically ill patients and it's association with mortality: A prospective study

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Abstract
Background and objectives: A study of prevalence of Hypomagnesemia in critically ill patients of all age group and it's significance in mortality among them.
Materials and methods: 100 cases admitted at Intensive Medical care unit of Government Kilpauk Medical college Hospital, Chennai, during the period April 2015 to September 2016, from various causes, were included in the study after taking into account the inclusion and exclusion criteria. Out of the 100 cases 56 were males and 44 were females. All the 100 cases were treated for relevant diseases and their laboratory work up and follow up data were collected and studied.
Results: In our study we analysed 100 patients, in that 53 persons are hypomagnesemics, 47 persons are normomagnesemics. The minimum age of the patient is 18. The maximum age is 86. Among 100 population, magnesium levels was found to be low in 16 cases of sepsis, 9 cases of CVA, 7 cases of poisoning, 6 cases of heart failure, 5 cases of respiratory failure, 4 cases of DKA, 3 cases of status epilepticus and 3 cases of snake bite. Among these, patients with sepsis had more percentage of hypomagnesemic levels. Of 100 patients 20 died, out of which 16 had hypomagnesemia. $P<0.05$ which is statistically significant.
Conclusion: Hypomagnesemia is a common electrolyte imbalance in the critically ill patients, frequently associated with sepsis and associated with higher mortality and morbidity rate. Correction of hypomagnesemia is very essential in the Management of critically ill patients to have a better prognosis.

Keywords: hypomagnesemia, critically ill patients, mortality, sepsis

Introduction
Magnesium is the second most plentiful intra-cellular cation after potassium, fourth most plentiful after sodium, potassium and calcium in humans[1]. It plays a vital role in the transfer, storage, utilization of energy and it regulates as well as catalyzes >300 enzyme systems [2]. The enzymes needing magnesium are involved in intermediary metabolism, transcellular ion transport, muscle contraction, oxidative phosphorylation [3]. Hypomagnesemia has been expected to develop in 20% to 65% of critically ill patients during course of their stay in intensive care unit. Factors contributing to magnesium deficiency in critical care settings are reduced absorption due to altered gastrointestinal activity, malnutrition, renal loss of various drugs, diabetic individuals, hypokalemia, hypocalcemia, poor content of magnesium in TPN solution. Hypomagnesemia in critically ill patients has been found to have a higher APACHE II score and causes an increased requirement for ventilatory support as well as its duration because hypomagnesemia causes muscle weakness and respiratory failure which leads very much difficult to weaning the patient from the ventilator. Prolonged stay in Intensive medical care unit (IMCU) is also associated with higher mortality and morbidity [4].

Methodology
This study was done at Govt. Kilpauk Medical college hospital, Chennai during a period betweenApril 2015 to September2016. This is a Prospective and observational study which had a sample size of 100 patients.

Inclusion Criteria
These includes patients admitted in ICU with Cardiac Failure, Respiratory Failure, Poisoning, Snake bite, Sepsis, Cerebero vascular accident, Status epilepticus, Diabetic Keto Acidosis.

Exclusion Criteria
1. Patients who had previously documented Hypomagnesemia.
2. Patients with Renal failure and those who have magnesium more than 2.5mg/dl.
3. Patients who were on Magnesium supplementation and Blood Transfusion.

Method of Collection of Data
The data of each patient were collected in the specific proforma which included detailed history and thorough physical examination. Serum Magnesium was estimated within 24 hours of admission. Other relevant investigations like CBC,

Observations and Results
The study was prospective, observational, non-interventional and follow up study. 100 patients were selected randomly who fulfils RFT, LFT, Urine routine, ECG, ECHO, CXR PA view, CT BRAIN Plain, ABG analysis were done for patients appropriate to their clinical condition The outcome of the patient was analysed by Length of stay in ICU, Need for ventilatory support and Survival/death

Method of Serum Magnesium Estimation
Calmagite Test was used to assess serum magnesium level. Reference range for Magnesium: 1.7- 2.5 mg/dl.

Statisical Analysis
The study design was a prospective non interventional observational study.
All data collected were noted using a structured proforma, including the investigations.
Data was analysed using statistical package and SPSS structured software to find out the proportion of hypomagnesimia among 100 patients, and their clinical profile and outcome of them.

Funding Agency: None.

Ethical Concerns: As per the institution protocol.

Consent: Informed consent was taken as per standard procedure that is followed in the institution.
The criteria for the study. Following parameters were observed in our study. In our study we analysed 100 patients, in that 53 persons are hypomagnesemics, 47 persons are normomagnesemics.
The minimum age of the patient is 18. The maximum age is 86. Among the 100 patients, 5% are in the age group of <20. 14% are in the age group of 21-30. 20% are in the age group of 31-40. 22% are in the age group of 41-50.
14% are in the age group of 51-60. 21% are in the age group of 61-70. 4% are in the age group of >70. Among 100 population, magnesium levels was found to be low in 16 cases of sepsis, 9 cases of CVA, 7 cases of poisoning, 6 cases of heart failure, 5 cases of respiratory failure, 4 cases of DKA, 3 cases of status epilepticus and 3 cases of snake bite. Among these, patients with sepsis had more percentage of hypomagnesemic levels.
Among 100 population, 20% are alive, 80% are died persons of 100 patients 20 died, out of which 16 had hypomagnesemia. $P<0.05$ which is statistically significant.

Table 1: Mortality among patients with Hypomagnesemia

Mortality	Magnesium		Total
	Hypomagnesemia	normal	
Yes	16	4	20
No	37	43	80
Total	53	47	100

Discussion
Magnesium is a macro mineral. It acts as an essential for life. It is needed by the body in large amounts for many bodily function, like cardiac function, various enzymatic reactions, neuromuscular function, energy production, endocrine function, bone formation and growth, DNA repair and immunity [5].
Magnesium levels are altered in many conditions like sepsis, inadequate magnesium intake, increased renal loss in case of alcohol abuse, diuretics and digoxin use, and gastrointestinal loss in case of vomiting, diarrhoea, Nasogastric tube loss, total parenteral nutrition, refeeding with glucose or aminoacids

Table 2: Age Distribution of Patients

Age in years	No. of cases	percent
<20	5	5
21-30	14	14
31-40	20	20
41-50	22	22
51-60	14	14
61-70	21	21
>70	4	4
Total	100	100

Insulin, metabolic acidosis and hypoalbuminemia, diabetics and acute pancreatitis [6]. Hypomagnesemia leads to muscular weakness, neuromuscular irritability, cardiac arrhythmia, electrolyte disturbances, seizures, and coma. So critically ill patients are at increased risk for hypomagnesemia and development of hypomagnesemia related mortality [7]. In our study, a total of 100 patients were enlisted who were admitted in Intensive medical care unit. We tried to find out prevalence of low serum magnesium level in patients admitted in Intensive medical care unit and association between serum magnesium levels and length of stay, need for ventilator support, duration of ventilator support, APACHE SCORE II, mortality and most predominant illness associated with hypomagnesemia and associated other electrolyte disturbances. In our study, among 100 patients, 53% patients had hypomagnesemia. Of 100 patients, 32 males had hypomagnesemia and 2 females had hypomagnesemia.

Conclusion
Hypomagnesemia is a common electrolyte imbalance in the critically ill medical patients. It is frequently associated with sepsis. It is associated with higher mortality and morbidity rate in critically ill patients. Also, hypomagnesemia is associated with increased length of stay and need for ventilatory support. In addition, hypomagnesemia is associated with increased APACHE score. It is associated with hyponatremia, hypokalemia, hypocalcemia. That is, low magnesium levels in patients admitted in intensive medical care unit may affect the prognosis of patients, hypomagnesemic patients have a guarded prognosis. Hence in IMCU set up monitoring of serum magnesium levels along with other electrolytes has a very important therapeutic as well as prognostic implication. Correction of hypomagnesemia is very essential in the management of critically ill patients to have a better prognosis.

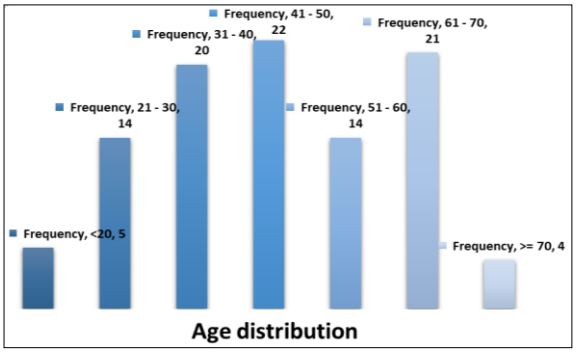

Fig 1: Age Distribution among Hypomagnesemia Patients

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