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ORIGINAL ARTICLE

Assessment of incidence and risk factors of hypomagenesia in critically ill patients

Praveen Saraswat

Associate Professor, Department of Paediatric, Hind Institute of Medical Sciences, Barabanki, UP, India

ABSTRACT:

Background: Hypomagnesemia, or low levels of magnesium in the blood, can occur in critically ill children for several reasons. The present study was conducted to assess incidence and risk factors of hypomagenesia in critically ill patients. **Materials & Methods:**84 pediatric intensive care unit (PICU) admissions of both genders. Parameters such as weight, admission category (cardiac disease, sepsis, renal failure, CNS related diseases, Trauma and others), co-morbid, metabolic profile (Serum sodium, potassium calcium, magnesium, blood urea nitrogen, creatinine and blood pH) was recorded. Total serum magnesium assay was measured by an end-point spectrophotometry. **Results:** Out of 84 patients, males were 51 and females were 33. Out of 84 PICU admission, hypomagnesia was found in 45 cases. Diseases causing PICU admission was sepsis in 26, cardiac disease in 15, renal failure in 10, CNS diseases in 7, trauma in 6 and others in 20 cases. Hypomagnesia was found in 17 cases of sepsis, 8 cases of cardiac diseases, 4 renal failures, 2 CNS diseases, 1 trauma and 13 others. Age <1 year was seen in 12, >1 year in 33, length of hospitalization was 1-5 days in 21 and >5 days in 34. Metabolic profile showed hyponatremia in 11, hypokalemia in 25, hypocalcemia in 20 and metabolic acidosis in 8 cases. Outcome was alive in 15 and death in 30 cases. The difference was significant (P< 0.05). **Conclusion:** Common risk factors for hypomagnesia was age >1 year, length of hospitalization was >5 days, hypokalemiaand hypocalcemia.

Keywords: magnesium, PICU, Morbidity

Corresponding author: Praveen Saraswat, Associate Professor, Department of Paediatric, Hind Institute of Medical Sciences, Barabanki, UP, India

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INTRODUCTION

More than 300 enzymatic activities in the body require magnesium (Mg), an essential cation, as a co-factor. It is essential for various bodily and cell activities, including neurotransmission, enzymatic reactions, muscle relaxation, and bone stability. Three fractions of magnesium are found in serum: the ionized or active form (65%), protein bound (27%), and a little amount that is additionally complexed to citrate, phosphate, and bicarbonate (8%).[1]

Hypomagnesemia, or low levels of magnesium in the blood, can occur in critically ill children for several reasons.[2] In critically ill children, hypomagnesemia can result from a variety of factors, including inadequate intake or absorption of magnesium, increased renal losses (e.g., due to diuretic use or renal dysfunction), gastrointestinal losses (e.g., diarrhea), and redistribution of magnesium into cells.Underlying medical conditions such as sepsis, acute kidney injury, gastrointestinal disorders, and endocrine disorders (e.g., diabetic ketoacidosis) can also contribute to hypomagnesemia.[3]

Hypomagnesemia may present with nonspecific symptoms, especially in children, making it challenging to diagnose based solely on clinical signs.[4]Common symptoms of hypomagnesemia in critically ill children may include irritability, muscle weakness or cramps, tremors, seizures, altered mental status, cardiac arrhythmias, and respiratory muscle weakness.Diagnosis of hypomagnesemia is confirmed through laboratory testing, specifically measuring serum magnesium levels.[5] Normal serum magnesium levels typically range from 1.7 to 2.2 mg/dL (0.7 to 0.9 mmol/L) in children.It's important to recognize that serum magnesium levels may not always accurately reflect total body magnesium stores, as most magnesium is intracellular.[6]The present study was conducted to assess incidence and risk factors of hypomagenesia in critically ill patients.

MATERIALS & METHODS

The present study consisted of 84 pediatric intensive care unit (PICU) admissions of both genders. The age ranged 1 month- 18 months. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Parameters such as weight, admission category (cardiac disease, sepsis, renal failure, CNS related diseases, Trauma and others), co-morbid, metabolic profile (Serum sodium, potassium calcium, magnesium, blood urea nitrogen, creatinine and blood pH) was recorded. Total serum magnesium assay was measured by an end-point spectrophotometry. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 84		
Gender	**Male**	**Female**
Number	51	33

Table I shows that out of 84 patients, males were 51 and females were 33.

Table II Incidence of hypomagnesemia in admitted PICU patients

Disease	Number (84)	Hypomagnesemia (45)
Sepsis	26	17
Cardiac disease	15	8
Renal Failure	10	4
CNS disease	7	2
Trauma	6	1
Others	20	13

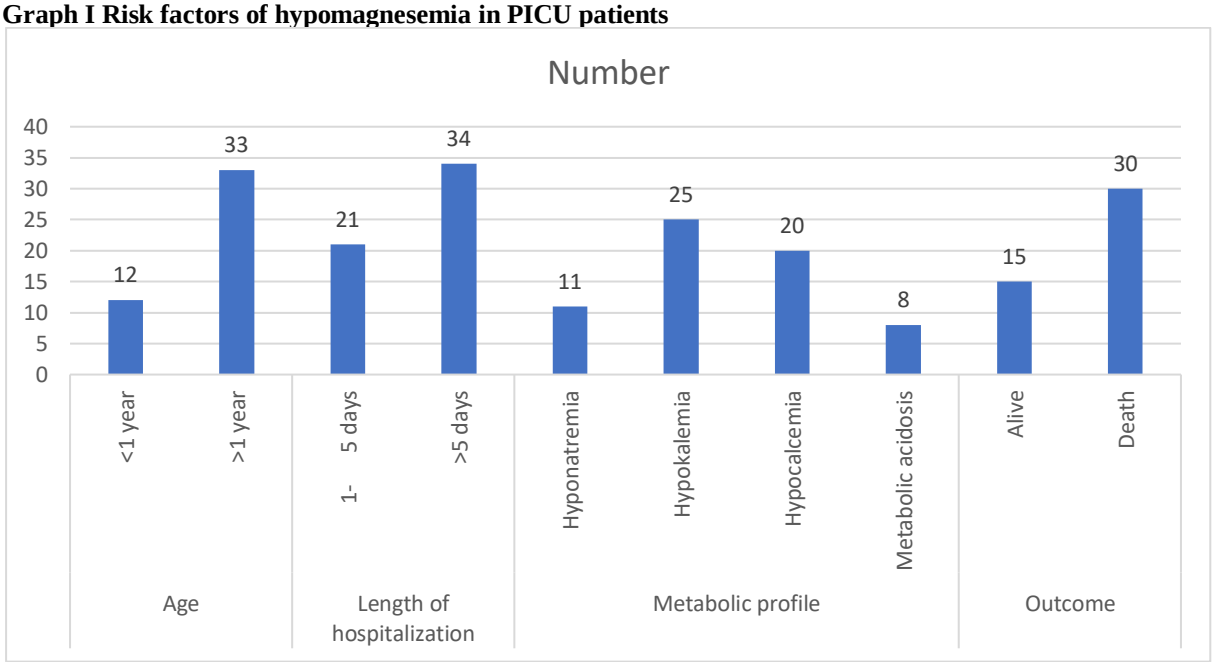
Table II, graph I shows that out of 84 PICU admission, hypomagnesia was found in 45 cases. Diseases causing PICU admission was sepsis in 26, cardiac disease in 15, renal failure in 10, CNS diseases in 7, trauma in 6 and others in 20 cases. Hypomagnesia was found in 17 cases of sepsis, 8 cases of cardiac diseases, 4 renal failures, 2 CNS diseases, 1 trauma and 13 others.

Table III Risk factors of hypomagnesemia in PICU patients

Parameters	Variables	Number	P value
Age	<1 year	12	0.02
	>1 year	33	
Length of hospitalization	1- 5 days	21	0.05
	>5 days	34	
Metabolic profile	Hyponatremia	11	0.04
	Hypokalemia	25	
	Hypocalcemia	20	
	Metabolic acidosis	8	
Outcome	Alive	15	0.01
	Death	30	

Table III shows that age<1 year was seen in 12, >1 year in 33, length of hospitalization was 1-5 days in 21 and >5 days in 34. Metabolic profile showed hyponatremia in 11, hypokalemia in 25, hypocalcemia in 20 and metabolic acidosis in 8 cases. Outcome was alive in 15 and death in 30 cases. The difference was significant (P< 0.05).

Graph I Risk factors of hypomagnesemia in PICU patients



DISCUSSION

Close monitoring of serum magnesium levels and clinical symptoms is essential during treatment to ensure adequate correction without causing adverse effects.[7]In most cases, hypomagnesemia in critically ill children can be effectively treated with appropriate supplementation, and prognosis is generally favorable with prompt diagnosis and management.[8]Overall, hypomagnesemia is a significant concern in critically ill children, and early recognition and treatment are essential for preventing complications and improving outcomes.[9]The present study was conducted to assess incidence and risk factors of hypomagenesia in critically ill patients.

We found that out of 84 patients, males were 51 and females were 33. Saleem et al[10]determined the frequency and associated risk factors of hypomagnesemia in pediatric intensive care unit on admission. Patients were divided into two groups according to their Mg level (Normo-magnesemic and Hypomagnesemic) and their p-value, crude and adjusted odds ratios (AoR) were calculated. Results. Upon admission in PICU 79(44%) patients were found hypomagnesemia. There was no difference in age and gender between two groups. The important risk factors identified were age greater than one year (p 0.05, AOR 3.71), sepsis (p 0.03, AOR 3.11), hypokalemia (p 0.06, AOR 1.8), hypocalcemia (p 0.05, AOR 1.6), diuretic use (p 0.05, AOR 1.37), Aminoglycoside use (p 0.003, AOR 3.12), and hospitalization greater than five days (p 0.03, AOR 1.71). Those with normomagnesemic had higher mortality rate (32/100 or 32%) than those with hypomagnesemia (22/79 or 27.8%).

We found that out of 84 PICU admission, hypomagnesia was found in 45 cases. Diseases causing PICU admission was sepsis in 26, cardiac disease in 15, renal failure in 10, CNS diseases in 7, trauma in 6 and others in 20 cases. Hypomagnesia was found in 17 cases of sepsis, 8 cases of cardiac diseases, 4 renal failures, 2 CNS diseases, 1 trauma and 13 others. We found that age <1 year was seen in 12, >1 year in 33, length of hospitalization was 1-5 days in 21 and >5 days in 34. Metabolic profile showed hyponatremia in 11, hypokalemia in 25, hypocalcemia in 20 and metabolic acidosis in 8 cases. Outcome was alive in 15 and death in 30 cases. Soliman et al[11] recorded prevalence of ionized hypomagnesemia in critically ill patients and to evaluate its relationship with organ dysfunction, length of stay, and mortality.The ionized magnesium level (normal value, 0.42-0.59 mmol/L) was measured at admission and then every day until discharge from the ICU. At admission, 18% of patients had ionized hypomagnesemia, 68% had normal ionized magnesium levels, and 14% had ionized hypermagnesemia. There was no significant difference in the length of stay or in the mortality rate between these three groups of patients. Hypomagnesemic patients more frequently had total and ionized hypocalcemia, hypokalemia, and hypoproteinemia. A total of 23 patients developed ionized hypomagnesemia during their ICU stay; these patients had higher Acute Physiology And Chronic Health Evaluation II (14.9 +/- 5.4 vs. 11.0 +/- 6.2) and Sequential Organ Failure Assessment (SOFA; 7.1 +/- 5.4 vs. 3.9 +/- 2.8) scores at admission (p <.01 for both), a higher maximum SOFA score during their ICU stay (10.0 +/- 5.6 vs. 4.4 +/- 3.2, p <.01), a higher prevalence of severe sepsis and septic shock (57 vs. 11%, p <.01), a longer ICU stay (15.4 +/- 15.5 vs. 2.8 +/- 4.7 days, p <.01), and a higher mortality rate (35% vs. 12%, p <.01) than the other patients. The major risk factors for developing hypomagnesemia during the ICU stay were a prolonged ICU stay, treatment with diuretics, and sepsis.

The limitation of the study is the small sample size.

CONCLUSION

Authors found that common risk factors for hypomagnesia was age >1 year, length of hospitalization was >5 days, hypokalemia and hypocalcemia.

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