



Original / Otros

Hypomagnesaemia in critically ill patients with haematological malignancies

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Abstract

Introduction: There is currently little information regarding the incidence of hypomagnesaemia and its impact on the prognosis of critically ill patients with haematological malignancies.

Objective: This study sought to describe the incidence of hypomagnesaemia in critically ill patients with haematological malignancies admitted to an oncological intensive care unit (ICU).

Methods: A total of 102 critically ill patients with haematological malignancies, who were 18 years of age and admitted to the ICU between January 2008 and April 2011, were included in this study. Hypomagnesaemia was defined as a serum magnesium concentration below 1.7 mg/dl.

Results: The incidence of hypomagnesaemia at admission or during the first 24 hours of stay in the ICU was 22.5% (23/102). The hospital mortality rates of patients with and without hypomagnesaemia were 47.8% and 60.7%, respectively.

Conclusion: The incidence of hypomagnesaemia in critically ill patients with haematological malignancies was 22.5%. Mortality in the ICU and in the hospital was similar in patients with and without hypomagnesaemia.

(Nutr Hosp. 2014;30:183-187)

DOI:10.3305/nh.2014.30.1.7151

Key words: *Hypomagnesaemia. Critically ill patients. Haematological malignancies. Intensive care unit. Mortality. Outcome.*

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Recibido: 18-XI-2013.
1.ª Revisión: 20-I-2014.
2.ª Revisión: 27-II-2014.
Aceptado: 14-IV-2014.

HIPOMAGNESEMIA EN PACIENTES HEMATOLÓGICOS CRÍTICAMENTE ENFERMOS

Resumen

Introducción: En la actualidad existe poca información relacionada con la incidencia de hipomagnesemia y su impacto en el pronóstico de pacientes hematológicos críticamente enfermos.

Objetivo: Describir la incidencia de hipomagnesemia en pacientes hematológicos ingresados a una unidad de cuidados intensivos (UCI) oncológica.

Métodos: Se incluyeron 102 pacientes con enfermedad hematológica, mayores de 18 años, ingresados en la UCI entre enero 2008 y abril 2011. Se definió hipomagnesemia como concentración sérica de magnesio inferior a 1,7 mg/dl.

Resultados: La incidencia de hipomagnesemia al ingreso o durante las primeras 24 horas de estancia en la UCI fue del 22,5% (23/102). La mortalidad hospitalaria de los enfermos con y sin hipomagnesemia fue del 47,8% y 60,7%, respectivamente.

Conclusión: La incidencia de hipomagnesemia en pacientes hematológicos críticamente enfermos fue del 22,5%. La mortalidad en UCI y en el hospital fue similar en los enfermos con y sin hipomagnesemia.

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Palabras clave: *Hipomagnesemia. Enfermedades hematológicas. Unidad de cuidados intensivos. Mortalidad. Pronóstico.*

Introduction

Electrolyte abnormalities are a common medical problem in critically ill patients. During their stay in the intensive care unit (ICU), these patients have alterations in serum sodium, potassium, magnesium, chlorine and phosphorus. The normal plasma concentration of magnesium is between 1.7 and 2.3 mg/dl. Its absorption occurs in the gastrointestinal tract at the level of the jejunum and ileum, and 80% of magnesium is excreted by 80% glomerular filtration, with 60% of this being reabsorbed in the proximal tubule¹. The observed rate of hypomagnesaemia in critically ill patients is 60%². Hypomagnesaemia is defined as serum magnesium values below 1.7 mg/dl. Most episodes of hypomagnesaemia in critically ill patients are asymptomatic; however, when serum magnesium values are less than 1.2 mg/dl signs, then symptoms occur, such as lethargy, confusion, coma, convulsions, ataxia, nystagmus, prolongation of the QT on the electrocardiogram, and atrial and ventricular arrhythmias. Additionally, hypokalemia can occur simultaneously. Causes of hypomagnesaemia in critically ill patients with haematological malignancies include: administering total parenteral nutrition for an extended period of time, nasogastric suction, diarrhoea, vomiting and the use of certain drugs (loop diuretics, aminoglycosides, cyclosporine, amphotericin B, cisplatin)³. At present, there is little information regarding the incidence of hypomagnesaemia and its impact on the prognosis of critically ill patients with haematological malignancies. The aim of this study was to describe the incidence of hypomagnesaemia in haematological oncology patients admitted to the ICU.

Methods

This study is a sub-analysis of an observational prospective cohort study conducted between January 1, 2008 and April 30, 2011, which was previously approved by the Bioethics Committee of Instituto Nacional de Cancerología (INCan), and the need for informed consent was waived⁴. The INCan is located in Mexico City, Mexico. The ICU at INCan is a mixed unit with six adult medical-surgical beds that are exclusively used for oncology patients. At least one intensivist and six nurses are on duty 24 hours a day (eight-hour shifts). The nurse - patient ratio is 1:1. Daily review of patients admitted to the ICU is performed by a multidisciplinary team that include medical staff and nurses, oncologists, haematologists, surgeons, infectious disease specialists and nutritionists. Approximately 300 patients per year are admitted to the ICU⁵.

All patients over 18 years with haematologic malignancies admitted to the ICU during the study period were included. The demographic, clinical and labora-

tory variables were collected during the first day of ICU stay. The length of stay in the ICU, and the total length of hospital stay were recorded. Hypomagnesaemia was defined as a serum magnesium concentration below 1.7 mg/dl.

Statistical Analysis

Continuous variables were expressed as the mean \pm standard deviation or as the median and interquartile range if the distribution of data was not normal.

To compare continuous variables Student's t-test or the Mann Whitney U test according to the sampling distribution was used. For the analysis of categorical variables, the chi-square test or the Fisher exact test was used. Survival curves were estimated by the Kaplan-Meier method. Survival data were compared using the log-rank test (log-rank test). In all cases, a value of $p < 0.05$ was considered statistically significant. SPSS 21.0 was used to analyse data.

Results

One hundred two patients with haematological malignancies were included in this study. The incidence of hypomagnesaemia at admission or during the first 24 hours of ICU stay was 22.5% (23/102). Eighty-seven patients required mechanical ventilation (85.2%). Of the patients who had magnesium concentrations below 1.7 mg/dl, none had arrhythmias during their stay in the ICU (table I).

The median serum magnesium level for the entire group of patients was 2.1 mg/dl, with the medians of the normal magnesium and hypomagnesaemia group at 1.5 and 2.2 mg/dl, respectively ($p < 0.001$). Patients with hypomagnesaemia had lower serum potassium levels compared with patients with normal serum magnesium (table II).

The hospital mortality in patients with and without hypomagnesaemia was 47.8% and 60.7%, respectively (table I). Figures 1 and 2 show the survival curves of critically ill patients with and without hypomagnesaemia during the ICU stay and hospital stay.

Discussion

Hypomagnesaemia is a common finding in hospitalised patients. The present study shows that 22.5% of patients with haematological malignancies admitted to the ICU have a serum magnesium concentration below 1.7 mg/dl. Different authors have reported a prevalence of hypomagnesaemia between 20 and 61%⁶⁻⁹. Other studies⁷⁻⁹ have presented a prevalence of hypomagnesaemia higher than that found in our study. Similar to the results of this work, Reinhart et al.⁶ reported that the incidence of hypomagnesaemia was

Table I
Clinical characteristics of critically ill patients with haematological malignancies with and without hypomagnesaemia

Variables	Hypomagnesaemia (Yes) n = 23	Hypomagnesaemia (No) n = 79	p
Age, years, mean ± SD	47.3 ± 18.8	41.6 ± 17.6	0.186
Men, n (%)	14 (60.8)	39 (49.3)	0.331
Female, n (%)	9 (39.1)	40 (56.6)	
APACHE score, mean ± SD	18.4 ± 7.2	17.2 ± 5.4	0.491
SOFA score, mean ± SD	10 ± 4	9.7 ± 3.8	0.746
Length of stay in ICU (days), median (IQR)	2 (2-11)	4 (1-9)	0.497
IMV, n (%)	20 (86.9)	67 (84.8)	0.990
Arrhythmias, n (%)	0(0)	3 (3.7)	0.999
ICU mortality, n (%)	11(47.8)	36 (45.5)	0.848
Hospital mortality, n (%)	11(47.8)	48 (60.7)	0.279

SD = standard deviation, APACHE II = Acute Physiology and Chronic Health Evaluation, SOFA = Sequential Organ Failure Assessment, ICU = intensive care unit, IQR = interquartile ranges IMV = invasive mechanical ventilation.

Table II
Other biochemical variables in critically ill patients with haematological malignancies with and without hypomagnesaemia

Variables	Hypomagnesaemia (Yes) n = 23	Hypomagnesaemia (No) n = 79	p
Sodium, mEq/L	138.2 ± 6	139.1 ± 5.8	0.523
Potassium, mEq/L	3.8 ± 0.80	4.2 ± 0.88	0.04
Chlorine, mEq/L	109.7 ± 6.9	110.1 ± 6.9	0.826
Phosphorus, mEq/L	4.5 (3.6-5)	4 (2.5-5)	0.234
Creatinine, mg/dL	0.9 (0.55-1.5)	0.9 (0.58-1.5)	0.968
Glucose, mg/dL	119 (104-137)	125 (101-159)	0.575

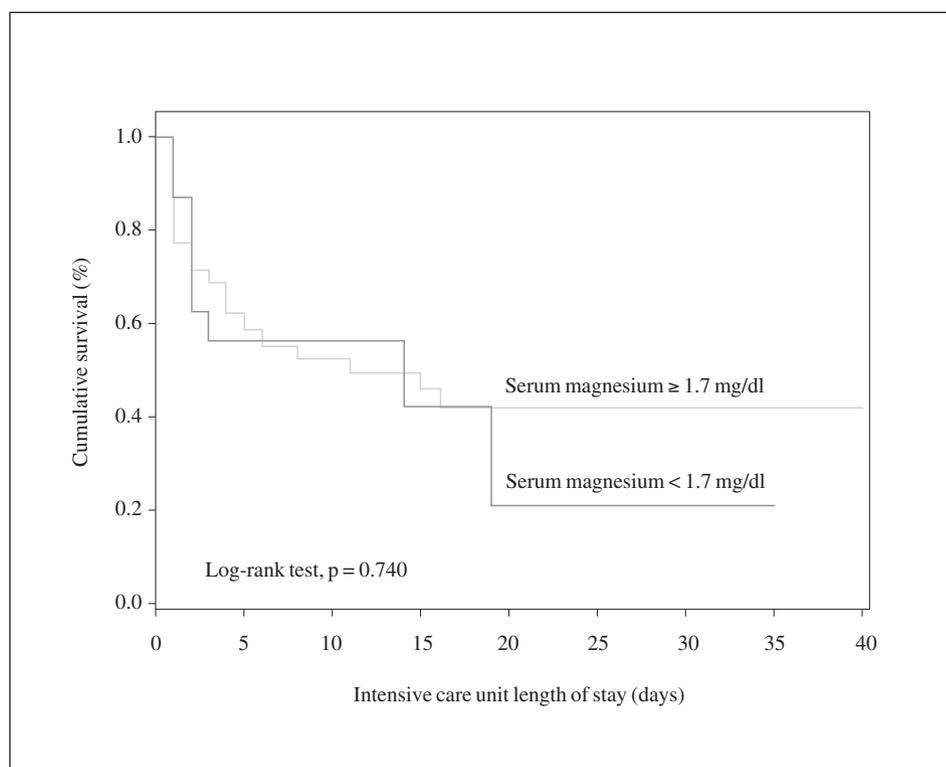


Fig. 1.—Shows the survival curves of critically ill patients with haematological malignancies with and without hypomagnesaemia during the stay in the intensive care unit.

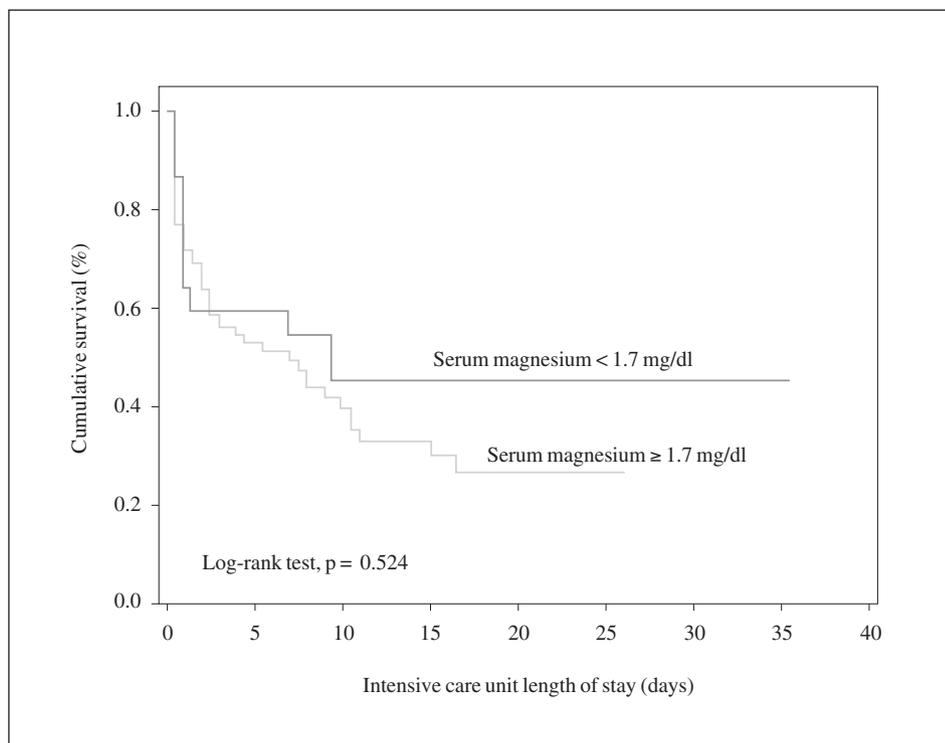


Fig. 2.—Shows the survival curves of critically ill patients with haematological malignancies with and without hypomagnesaemia during the hospital stay.

20% in critically ill patients admitted to the ICU, and the mean concentrations of magnesium were less than that found in our group of patients with haematologic malignancies. Although it has been reported that hypomagnesaemia is a risk factor for the development of arrhythmias³, in our study, the group of patients with hypomagnesaemia did not experience serious arrhythmias during their stay in the ICU. Often, patients with hypomagnesaemia have hypokalaemia¹⁰. The patients in our study with hypomagnesaemia had significantly lower potassium levels. The association between hypomagnesaemia and mortality varies from study to study. Soliman et al.¹³ reported that critically ill patients, on admission or during their stay in the ICU, develop low serum magnesium and, have a mortality of 19 to 35%, respectively. The study by Safavi et al.¹² showed a significant difference in the ICU mortality between patients with and without hypomagnesaemia at admission (55% versus 33%). Limaye et al.¹⁴ reported that the mortality rate in critically ill patients with hypomagnesaemia is significantly higher than in patients without hypomagnesaemia (57% versus 31%). Agus¹⁵ reported that magnesium correction does not improve the prognosis of patients with hypomagnesaemia. In our study, no statistically significant difference was observed in the mortality rate in the ICU and in the hospital between the groups with and without hypomagnesaemia.

The present work has the following limitations: the sample is relatively small and the experience of a single centre is presented.

Conclusions

The incidence of hypomagnesaemia in critically ill patients with haematological malignancies was 22.5%. The patients who presented with hypomagnesaemia also had potassium concentrations significantly lower than patients without hypomagnesaemia. Mortality in the ICU and in the hospital was similar in patients with and without hypomagnesaemia.

Acknowledgements

We thank the INCan (Mexico City) ICU nurses and medical staff who were involved in the care of these patients.

Conflict of interest

The authors declared that they have no conflict of interest.

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