



Letter to the Editor

Magnesium disorders: Myth or facts?

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Dear Editor,

Magnesium (Mg) represents the fourth most abundant cation in human body after sodium, potassium and calcium; it is mostly represented in the intracellular milieu where it participates in several functions [1].

Mg is a critical player in governing the function of numerous enzymes covering ~80% of known metabolic functions, as mitochondrial ATP synthase, Na⁺/K⁺-ATPase, creatine kinase, adenylate cyclase, phosphofructokinase or tyrosine kinase activity of the insulin receptor. Accordingly, Mg takes part in skeletal muscle and myocardial contraction, neuromuscular transmission, glycemic homeostasis and blood pressure control [1,2].

Pathological serum Mg concentration (i.e. hypomagnesemia or hypermagnesemia) has been associated with a wide range of diseases including metabolic, cardiovascular, neurological and psychiatric diseases and with higher mortality rate [1–6].

Hypomagnesemia and hypermagnesemia represent life threatening conditions; consequently, the clinicians need to know how frequent these disorders are in clinical practice. Thus, the main aim of our study was to investigate the prevalence and incidence of both hypomagnesemia and hypermagnesemia in a large cohort of unselected inpatients and outpatients. The secondary aim was to explore the variation of the incidence over time and whether age, gender and the unit in which the patient is hospitalized could be associated with serum Mg alterations.

We carried out a retrospective analysis of inpatients and outpatients whose Mg concentrations had been checked at the University Hospital of Messina, Messina, Italy, over the period from January 1, 2015 to December 31, 2017. Hypomagnesemia and hypermagnesemia were defined for Mg serum levels under 1.5 mg/dL and Mg serum levels above 3.8 mg/dL, respectively. The Chi-square test was used to calculate differences in the proportion of categorical variables. Linear regression was used to underline changes of incidences over time. For all tests, statistical significance was reached for values of $p < 0.05$.

This study involved a total of 12,696 subjects including inpatients [90.33% ($n = 11,469$)] and outpatients [9.67% ($n = 1227$)] whose Mg

levels were checked.

Overall, we found 8.43% ($n = 1071$) of patients showing hypomagnesemia and 1.78% ($n = 226$) of patients showing hypermagnesemia. Hypomagnesemia were encountered more frequently in female [53.3% ($n = 560$)] rather than in male patients [47.7% ($n = 511$)] ($\chi^2 = 4.03$, $p < 0.045$). Differently, cases of hypermagnesemia were equally distributed in male [50% ($n = 113$)] and female patients [50% ($n = 113$)] and was not influenced by age when considering three age groups (patients aged 0–18 yr, patients between 19 and 65 yr, patients over 65 yr) ($\chi^2 = 0.17$; $p < 0.91$) (Fig. 1).

Age influenced the distribution of cases of hypomagnesemia: patients over 65 yr showed the highest prevalence of hypomagnesemia [59.01% ($n = 632$)], whereas patients in the other age group exhibited lower prevalences; in particular, in patients aged 0–18 yr the prevalence of hypomagnesemia was 9.52% ($n = 102$) and in patients between 19 and 65 yr was 31.46% ($n = 337$) ($\chi^2 = 592.64$; $p < 0.0001$).

Inpatients showed similar hypomagnesemia and hypermagnesemia prevalence ($p > 0.05$).

Among the different Divisions of our Hospital where serum Mg levels were measured and where a minimum of twenty cases of hypomagnesemia or hypermagnesemia had been diagnosed, we found the highest prevalences of hypomagnesemia in Geriatrics [$n = 88$ (21.7%)] and Oncology [$n = 21$ (13.2%)] Units. Conversely, outpatients exhibited a relatively higher prevalence of hypermagnesemia [$n = 44$ (3.5%)] in comparison with any other Hospital Division. The hypomagnesemia and hypermagnesemia incidence did not change over time ($r = -0.61$; $p = 0.58$; $r = 0.96$; $p = 0.16$; respectively).

The results of this study support previous published data that suggested a prevalence of hypomagnesaemia ranging from 7% to 11% in hospital patients and a prevalence of hypermagnesemia from 5.7% to 9.3% [1,2,6]. Hypomagnesemia has been found to be more represented than hypermagnesemia and a slight but significant female gender dominance in the number of registered cases has been detected too.

Beyond the Mg dietary intake, it is not surprising that hypomagnesemia has been encountered more frequently in patients aged over 65 yr, due to morbidities and use of drugs (e.g. proton pump

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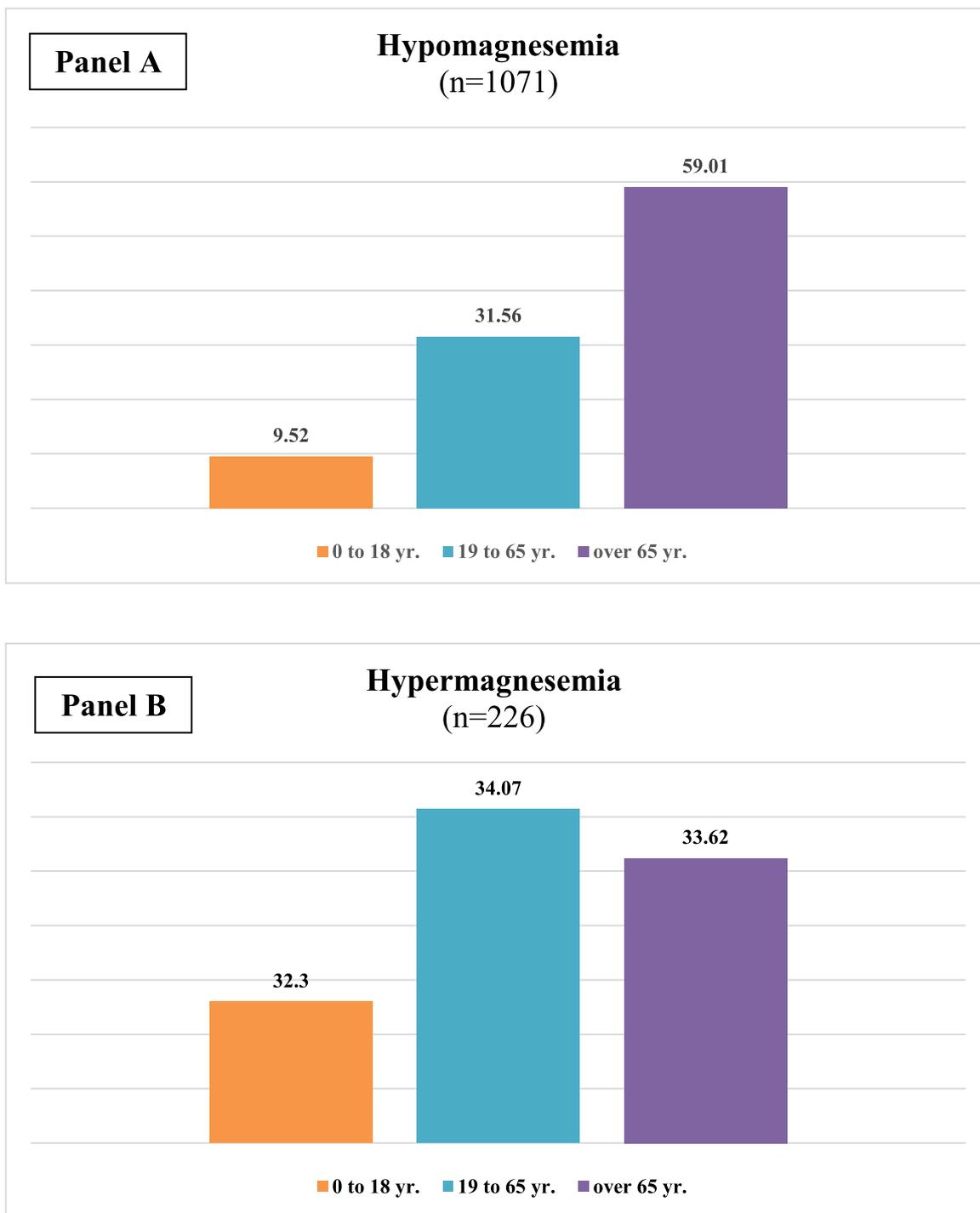


Fig. 1. Percent distribution of cases of hypomagnesemia (Panel A) and hypermagnesemia (Panel B) in a sample of 12,696 patients according to age.

inhibitors or diuretics) potentially leading to electrolytes disturbance in older adults [2,6,7]. In addition, hypomagnesemia has been encountered more likely in women and it may be speculated due to their longer life expectancy [2]. As expected, the fact of being hospitalized in the Geriatric unit, due to older age, was associated with high prevalence of hypomagnesemia as for other electrolytes disturbances [8–10].

Although a major limit of the present investigation is represented by the unknown participants clinical history, to the best of our knowledge, the largest sample ever considered for the study of both hypomagnesemia and hypermagnesemia and the inclusion of different age and gender groups strengthened our findings.

In conclusion, the role of Mg in the pathophysiology of multiple

human diseases has been consistently reported. Our data show a substantial prevalence and incidence of Mg disturbances, therefore Mg serum levels should be routinely checked in particular in hospitalized patients.

Clinicians should keep in mind that early recognition of disordered Mg metabolism and correction of the electrolyte imbalance may participate to general health and contribute to better disease outcomes.

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Declaration of Competing Interest

Antonino Catalano, Federica Bellone, Diego Chilà, Saverio Loddo and Francesco Corica declare that they have no conflicts of interest.

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