ORIGINAL ARTICLE

Hypomagnesaemia in critically ill patients- A cross-sectional study

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ABSTRACT

Background: Hypomagnesaemia results due to less intake, re-distribution of magnesium from extracellular to intracellular space, or raised renal or gastrointestinal loss. Hypomagnesaemia can cause severe outcome in ill patients.
Aim: To determine the frequency of hypomagnesaemia in critically ill patients
Study Design: Cross sectional survey.
Setting: Medical Department Jinnah Hospital Lahore
Duration: 6 months from 1st July 2017 to 31st December 2017
.**Data Collection:** 120 patients were enrolled. Venous blood sample of 1ml was taken from each patient included and sent to hospital laboratory for evaluation of serum magnesium levels. Data was analyzed by SPSS v22.
Results: The mean age of patients was 47.91±10.09years. There were 80 (66.7%) males and 40 (33.3%) females. The mean APACHE II score of patients was 38.66±3.55. The hypomagnesaemia was found in 30(25%)patients.
Conclusion: According to our study the frequency of hypomagnesaemia in critical ill medical patients was 30(25%).
Keywords: Critical, Medically Ill, Hypomagnesaemia, Patients

INTRODUCTION

Magnesium is the 4thmost rich cation in blood and the 2nd most common cation inside the cells[1].[1] It is essential for electrolyte homeostasis, intracellular calcium regulation, energy storage and utilization, protein synthesis regulation, and neurotransmitter release[1, 2].Adequate magnesium balance has less risk of inflammation, diabetes,colorectal cancer, stroke and cardiovascular disease events[2]. It has proven role in oxidative metabolism[1]. It acts as co-factor for >300 enzymatic reactions[3]. It serves its role in maintaining neuromuscular excitability and cardiac function[3].

The incidence of hypomagnesaemia is reported as, 10–20% in hospitalized, 50–60% Intensive Care Unit while 30–80% alcoholics and 25% in diabetics[2]. In one study, the reported prevalence of hypomagnesaemia was 24.29%in critically ill medical patients.Monitoring of serum magnesium levels has prognostic and therapeutic value[4]. The normal magnesium plasma concentration is from 1.7 mg/dl to 2.55mg/dl[4].

Long term total parenteral nutrition, hypoalbuminemia, diarrhea, vomiting, sepsis, use of loop diuretics and aminoglycosides can lead to increased frequency of hypomagnesaemia in critically ill patients at various settings[5, 6]. Magnesium deficiency can lead to important clinical consequences like hypocalcaemia, cardiac arrhythmias, neurotoxicity and hypokalemia[4,5]. When serum magnesium is below 1.2mg/dl then symptoms like confusion, nystagmus, ataxia, convulsions, comma, prolonged QT interval on ECG and atrial and ventricular arrhythmias can occur[5].

Purpose of conducting this study is to evaluate prevalence of hypomagnesaemia in critically ill hospitalized medical patients. By timely identifying the patients with hypomagnesaemia who are at risk of developing neurological and cardiovascular complications we can prevent and address these complications that may aggravate medical ailment.

The objective of the study was to determine the frequency of hypomagnesaemia in critically ill medical patients.

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MATERIAL & METHODS

This cross sectional study was conducted in the Department of Medicine, Jinnah Hospital Lahore from 1-7-2017 to 31-12-2017. WHO calculator was used to determine sample size, using anticipated population proportion of 24.29%[4], keeping level of confidence interval 95% and absolute precision of 8%. The minimal required sample size was calculated to be 120.
Sampling technique used was Non-probability, consecutive sampling.
Inclusion criteria: Both male and female patients of age 15 to 70 years who were suffering from life threatening diseases like sepsis, septic shock, cardiogenic shock, hepatic failure, renal failure, congestive cardiac failure, diabetic ketoacidosis, acute lung injury, acute exacerbation of asthma, acute exacerbation of COPD, multiorgan failure and status epilepticus with APACHE SCORE II more than 25 and duration of illness for more than 24 hours.
Exclusion criteria: Patients with documented hypomagnesaemia before admission, taking drugs causing hypomagnesaemia diuretic therapy (loop diuretcis, thiazide diuretics)and nephrotoxic drugs like aminoglycosides, cisplatin, amphotericin B and pentamidine
Data collection procedure: After seeking ethical approval from Institutional Research Forum of Jinnah hospital Lahore, all the patients fulfilling the selection criteria were enrolled after written informed consent.1ml sample of blood was taken from each patient included and sent to hospital laboratory for evaluation of serum magnesium levels. Reports were verified by pathologist. Serum magnesium level on day 1 and day 4 of hospital admission <1.7mg/dl

was considered hypomagnesaemia. All data was entered in structured proformas.

Data Analysis: Collected data was entered and analysed by SPSS V22. For categorical variables like gender, type of medical illness and presence or absence of hypomagnesaemia, frequencies along with percentages were calculated. For continuous variables like age, duration of disease, Apache II score and serum magnesium levels, means along with standard deviations was calculated. Confounders like age, sex, diseaseduration, type of medical illness was controlled by stratification. Post-stratification, chi-square test was applied with P-value≤0.05 as significant.

RESULTS

The mean age of the patients was 47.91±10.09years. There were 80(66.7%) males and 40(33.3%) females. The mean APACHE II score of the patients was 38.66±3.55 (Table 1). Most of the patients hadrespiratory failure including asthma COPD, interstitial lung disease and tuberculosis, Cardiac disease, sepsis leading to multiple organ failure and acute renal failure(Fig 1). The mean serum magnesium level at day 1 was 3.04±1.08. The mean serum magnesium level at day 14 was 2.22±0.82 (Table 2). The hypomagnesaemia was developed in 30(25%) patients (Fig 2).

Table 1: Demographics of patients

n	120
Age (years)	47.91±10.09
Gender	
Male	80 (66.7%)
Female	40 (33.3%)
APACHE II	38.66±3.55

Table 2: Descriptive statistics of serum magnesium level at day 1

	Day 1	**Day 14**
Serum Magnesium	3.04±1.08	2.22±0.82

Fig 1: Final medical diagnosis

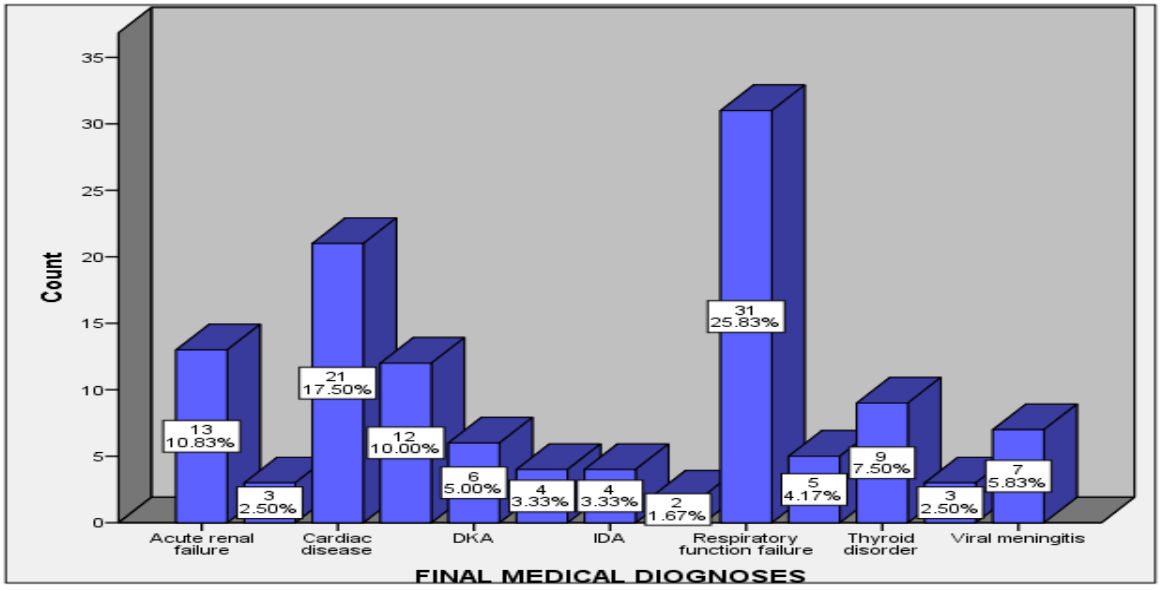
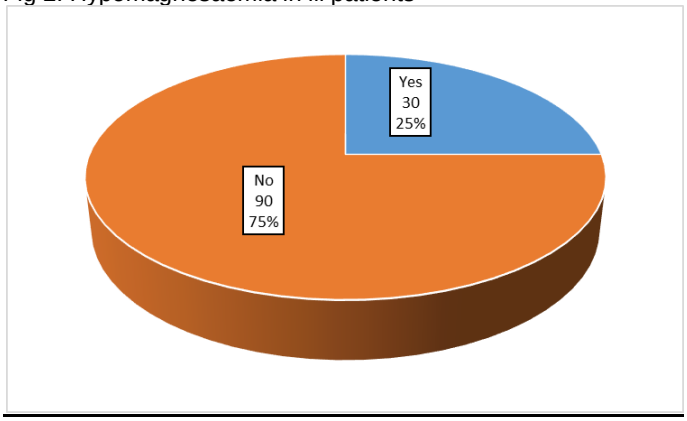


Fig 2: Hypomagnesaemia in ill patients



DISCUSSION

Hypomagnesaemia can also be called as magnesium deficiency. But, deficiency of magnesium in total body can be observed along with normal serum magnesium concentration and hypomagnesaemiamay also be present but without total body deficit.In our study, frequency of hypomagnesaemia in critically ill medical patients was 30(25%). Different studies have shown that prevalence of hypomagnesaemiais quite high ranging from 20% to 65%in critically ill patients.[12-14]in patients admitted in ICU have high risk of mortality due to hypomagnesaemia[15].

Limaye et al.,[3]found a very high rate of hypomagnesaemia in critically ill ICU admitted patients. Inhypomagnesemic patients, the need for ventilators was noticeably high as well as for prolonged duration also. Hypomagnesaemia was highly associated with diabetes and sepsis. But the duration of ICU stay and APACHE II score (at time of admission) was not associated with serum magnesium concentration. Hypomagnesaemia is more significantly observed in patients having deficiency of other elements including calcium and albumin.The incidence ofhypomagnesaemia is reported as, 10–20% in hospitalized patients, 50–60% ICU patients, and 30–80% in persons with alcoholism, and 25% in outpatients with diabetes[2].

In one study rate of hypomagnesaemia in critically ill medical patients was found to be 24.29%.Observing serum magnesium levels is very much important in both; prognostically and therapeutically[4].Soliman et al[16] assessed ionized Magnesium concentration in blood in 446 ICU admitted patients for >3months and found that 18% patients had ionized hypomagnesaemia, 14% had ionized hyper-magnesaemia and 68% had normal Magnesium concentration. But there was no association found between Magnesium concertation at time of admission and hospital stay or mortality.

Two recent large studies from India & China found significant association between hypomagnesaemia and outcome. Out of 601 ICU admitted patients, 25% had hypomagnesaemiaat the time of admission. Hypomagnesaemic patients had prolonged ICU stay (5.46±5.75 vs. 3.93±3.88days, P=0.0002), need for mechanical ventilation (56.9% vs. 24.3%, P<0.0001) and mortality (38.56% vs. 14.73%, P<0.0001), but duration of mechanical ventilation in insignificant (p>0.05)[17].

In another study, hypomagnesaemia was present in 27.3% patients admitted in ICU for critical ill condition. Hypomagnesaemic patients had significantly prolonged ICU stay (15.98±13.29 vs. 12.43±7.14 days, P=0.034), higher SOFA scores (6.86±3.12 vs. 5.46±2.75, P=0.004) and higher mortality (54.9% vs. 33.9%, P=0.010)[18].

Safavi et al examined serum Magnesium concentration at time of ICU admission in 100 patients, and found that admission APACHE and SOFA scores were higher in patients with hypomagnesaemia. The scores were also high during ICU stay, higher need for ventilators and higher mortality.[19]Chernow et al., examined serum Magnesium concentration in 193 ICU admitted patients and found hypomagnesaemia in 61% critically ill patients admitted to ICU[20].

CONCLUSION

The frequency of hypomagnesaemia in critical ill medical patients was 30(25%), which is not negligible.

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