

FREQUENCY OF HYPOMAGNESEMIA IN PATIENTS PRESENTING WITH ACUTE CORONARY SYNDROME

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ABSTRACT:

BACKGROUND: *Acute coronary syndrome (ACS) has been defined as a group of conditions due to decreased blood flow in the coronary arteries. Hypomagnesemia is an important risk factor for cardiac patients. Although the frequency reported in previous literature is variable. So we conducted this study to find the extent of problem in local population.*

AIMS & OBJECTIVE: *To determine the frequency of hypomagnesemia in patients presenting with acute coronary syndrome.*

MATERIAL & METHODS: *This cross sectional study was carried out at the department of Cardiology, Punjab Institute of Cardiology, Lahore over a period of six months from 05-09-2017 to 05-03-2018. Total 185 patients were enrolled in the study. Then blood sample was obtained and were sent to the laboratory of the hospital for assessment of magnesium level. Reports were assessed and if level is below normal, then hypomagnesemia was labeled.*

RESULTS: *The mean age of patients was 59.48±13.35 years. There were 92 (49.7%) males and 93 (50.3%) females. The mean magnesium level of patients was 1.73±0.50mg/dl. In this study, 38 (20.5%) patients had hypomagnesemia while 147 (79.5%) had normal magnesium level.*

CONCLUSION: *The frequency of hypomagnesemia was low in our study but cannot be ignored.*

KEY WORDS: *Hypomagnesemia, acute coronary syndrome, STEMI, NSTEMI, unstable angina, serum magnesium level*

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INTRODUCTION

Acute coronary syndrome (ACS) is defined as a group of conditions due to acute deficiency of blood flow in the coronary arteries. ST segment elevation myocardial infarction (STEMI), Non-ST segment elevation myocardial infarction (NSTEMI) and unstable angina are all included in ACS. Typical chest pain with ECG changes and raised cardiac biomarkers are required to establish the diagnosis.¹

Sometimes ACS may occur without ECG changes or raised biomarkers; in these cases the diagnosis is supported by previous history of coronary artery disease and other diagnostic investigations.² Magnesium is one of the important electrolytes in the body. Normal value of serum magnesium is 1.7 to 2.5 mg/dL. Magnesium is found mainly in the bones of the body.³ In a study by Reffelmann et al. hypomagnesemia is associated with high cardiovascular mortality.⁴

Various long-term complications of DM and poor glycemic control is linked with hypomagnesemia, which is an important risk factor for stent thrombosis and in-stent restenosis.^{5,6} There is high prevalence of hypomagnesemia in ACS patients. Approximately 12% hospitalized patients have low serum magnesium and commonly in 60-65% patients admitted in intensive care. A study by Anjum et al. reported that the frequency of hypomagnesemia was 8.2% in patients presenting with ACS.⁷ But another study showed that results of serum magnesium values showed that 22% cases were suffering from hypomagnesemia.⁸

Another study also showed that results of serum magnesium values showed that 24.7% cases were suffering from hypomagnesemia.⁹ Hypomagnesemia was found in 12.5% of STEMI, 9.7% of UA, 29.7% of NSTEMI.¹⁰ Literature has showed that frequency of hypomagnesemia was low in ACS patients but controversial evidence have also been observed in literature showing high prevalence of hypomagnesemia in ACS patients. This study was carried-out to see the extent of problem in local population. So that early management or some preventive measures can be planned and implemented in ACS patients with hypomagnesemia.

MATERIAL AND METHODS:

This cross sectional study was carried out at the department of Cardiology, Punjab Institute of Cardiology, Lahore over a period of six months from 05-09-2017 to 05-03-2018. Total 185 patients were enrolled in the study. Hypomagnesemia

was noted in the blood samples of the patients. Sample size of 185 cases was calculated with 95% confidence level, 4% margin of error and taking expected percentage of hypomagnesemia i.e. 8.2% in patients presenting with ACS. Non-probability, consecutive sampling technique was used. Patients of age 35-80 years of either gender presenting with ACS (as per operational definition) presented in emergency within 12 hours of symptoms were included. Patients on diuretics, alcoholics (on history), patients having malabsorption, laxative abuse or malnutrition (on medical record) were excluded.

DATA COLLECTION PROCEDURE:

185 patients were enrolled in the study from emergency department of PIC, Lahore.

Informed consent was taken from all study participants. Their baseline characteristics like name, age, gender, BMI, type of ACS were noted. Blood samples were taken and stored in sterile container and were sent to the laboratory of the hospital for assessment of magnesium level. Reports were assessed and if level is below normal, then hypomagnesemia was labeled (as per operational definition).

Operational definition

Acute coronary syndrome: It was defined in three categories i.e. unstable angina (abnormal ECG but normal trop-T <100), STEMI (ST elevation >2 mm in precordial leads and >1 mm in limb leads on ECG plus trop-T >100) or NSTEMI (top-t >100 without ST elevations on ECG).

Hypomagnesemia: It was labeled if serum magnesium level <1.5mg/dl at time of presentation

DATA ANALYSIS:

SPSS version 21 was used to analyze the data. Quantitative variables like age and BMI were presented in form of mean \pm S.D. Qualitative variables like gender, type of ACS and hypomagnesemia were presented in form of frequency and percentage. Data was stratified for age, gender, BMI and type of ACS. Post-stratification, chi-square was applied to compare frequency of hypomagnesemia in stratified groups. P-value \leq 0.05 was considered as significant.

RESULTS:

The mean age of patients was 59.48 ± 13.35 years. (Table 1) There were 92 (49.7%) males and 93 (50.3%) females. (Fig 1) The mean BMI of patients was 26.47 ± 4.74 kg/m². (Table 1). There were 64 (34.6%) patients with unstable angina, 63 (34.1%) had STEMI and 58 (31.4%) had NSTEMI.

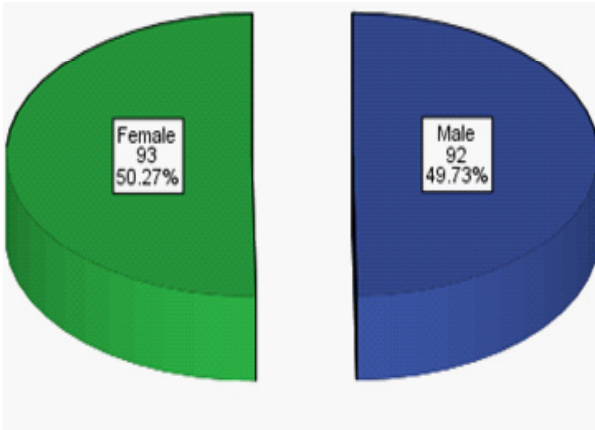


Fig 1: Distribution of gender of patients

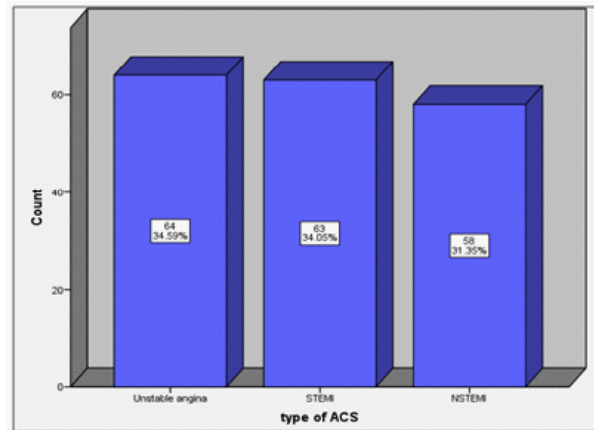


Fig 2: Distribution of type of ACS

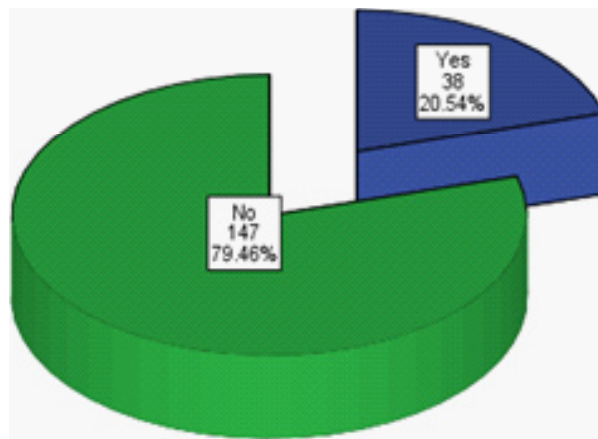


Fig 3: Distribution of hypomagnesemia in patients

Table 1: Baseline demographic characteristics of the patients			
Age (years)	35 (minimum)	80 (maximum)	59.48 ± 13.35 (mean)
Gender	92 male (49.7%)	93 females (50.3%)	185 (total)
BMI (Kg / m ²)	18.5 (minimum)	34.97(maximum)	26.47 ± 4.74 (mean)

Table 2: Descriptive Statistics of serum magnesium level		
Magnesium level (mg/dl)	n	185
	Mean	1.73
	SD	0.50
	Minimum	0.5
	Maximum	2.4

(Fig 2). The mean magnesium level of patients was 1.73 ± 0.50 mg/dl. (Table 2). In this study, 38 (20.5%) patients had hypomagnesemia while 147 (79.5%) had normal magnesium level. (Fig 3). Data was stratified for age of patients. In patients aged 35-50years, 11 (20.0%) had

hypomagnesemia while 44 (80.0%) had normal magnesium level. In patients aged 51-75years, 20 (18.9%) had hypomagnesemia while 86 (81.1%) had normal magnesium level. In patients aged >75years, 7 (29.2%) had hypomagnesemia while 17 (70.8%) had normal magnesium level. The

Table 3: Comparison of hypomagnesemia in age strata

		Age (years)			Total
		35-50	51-75	>75	
Hypomagnesemia	Yes	11 (20.0%)	20 (18.9%)	7 (29.2%)	38 (20.5%)
	No	44 (80.0%)	86 (81.1%)	17 (70.8%)	147 (79.5%)
Total		55 (100%)	106 (100%)	24 (100%)	185 (100%)

Chi-square test = 1.286 p-value = 0.526 (Insignificant)

Table 4: Comparison of hypomagnesemia in both genders

		Gender		Total
		Male	Female	
Hypomagnesemia	Yes	21 (22.8%)	17 (18.3%)	38 (20.5%)
	No	71 (77.2%)	76 (81.7%)	147 (79.5%)
Total		92 (100%)	93 (100%)	185 (100%)

Chi-square test = 0.586 p-value = 0.444 (Insignificant)

Table 5: Comparison of hypomagnesemia in BMI strata

		BMI			Total
		Normal	Overweight	Obese	
Hypomagnesemia	Yes	19 (25.0%)	14 (25.0%)	5 (9.4%)	38 (20.5%)
	No	57 (75.0%)	42 (75.0%)	48 (90.6%)	147 (79.5%)
Total		76 (100%)	56 (100%)	53 (100%)	185 (100%)

Chi-square test = 5.516 p-value = 0.060 (Insignificant)

Table 6: Comparison of hypomagnesemia in type of ACS

		Age (years)			Total
		Unstable angina	STEMI	NSTEMI	
Hypomagnesemia	Yes	12 (18.8%)	11 (17.5%)	15 (25.9%)	38 (20.5%)
	No	52 (81.3%)	52 (82.5%)	43 (74.1%)	147 (79.5%)
Total		64 (100%)	63 (100%)	58 (100%)	185 (100%)

Chi-square test = 1.498 p-value = 0.473 (Insignificant)

difference was insignificant ($p > 0.05$). (Table 3)
 Data was stratified for gender of patients. In male patients, 21 (22.8%) had hypomagnesemia while 71 (77.2%) had normal magnesium level. In female patients, 17 (18.3%) had hypomagnesemia while 76 (81.7%) had normal magnesium level. The difference was insignificant ($p > 0.05$). (Table 4)
 Data was stratified for BMI of patients. In patients with normal BMI, 19 (25.0%) had hypomagnesemia while 57 (75.0%) had normal magnesium level. In overweight patients, 14 (25.0%) had hypomagnesemia while 42 (75.0%) had normal magnesium level. In obese patients, 5 (9.4%) had hypomagnesemia while 48 (90.6%) had normal magnesium level. The difference was insignificant ($p > 0.05$). (Table 5)

Data was stratified for type of ACS. In patients with unstable angina, 12 (18.8%) had hypomagnesemia while 52 (81.3%) had normal magnesium level. In patients with STEMI, 11 (17.5%) had hypomagnesemia while 52 (82.5%) had normal magnesium level. In patients with NSTEMI, 15 (25.9%) had hypomagnesemia while 43 (74.1%) had normal magnesium level. The difference was insignificant ($p > 0.05$). (Table 6)

DISCUSSION:

Magnesium levels in the body are very important because it plays an important role in the activation of around three hundred enzymes. So, magnesium has a crucial role in different diseases including cardiovascular diseases.¹¹ Multiple studies in this regard have shown the association of magnesium

levels and outcome of the coronary artery disease.¹²

In our study, the mean magnesium level of patients was 1.73 ± 0.50 mg/dl and about 38 (20.5%) patients had hypomagnesemia while 147 (79.5%) had normal magnesium level. One study reported that the frequency of hypomagnesemia was 8.2% in patients presenting with ACS.⁷ But another study showed that results of serum magnesium values showed that 24.7% cases were suffering from hypomagnesemia. Hypomagnesemia are often present in patients with ACS. Early assessment of electrolyte serum concentration is needed in order to implement proper supplementation.⁸

Another study also showed that results of serum magnesium values showed that 24.7% cases were suffering from hypomagnesemia.⁹ Hypomagnesemia was found in 12.5% of STEMI, 9.7% of UA, 29.7% of NSTEMI.¹⁰ It was proven that 6.9 - 11% of hospitalized patients with acute myocardial infarction and have a lack of magnesium.^{13, 14}

Makoui found that hypomagnesemia was present in 23.6% patients of ACS.² Taneva also found that hypomagnesemia was present in 28.98% patients of ACS.¹⁵ According to Purvis and Movahed, prevalence of hypomagnesemia in ACS patients was 7.7%.¹⁶

The mean age of patients was 59.48 ± 13.35 years. Data was stratified for age of patients. In patients aged 35-50 years, 11 (20.0%) had hypomagnesemia while 44 (80.0%) had normal magnesium level. In patients aged 51-75 years, 20 (18.9%) had hypomagnesemia while 86 (81.1%) had normal magnesium level. In patients aged

>75 years, 7 (29.2%) had hypomagnesemia while 17 (70.8%) had normal magnesium level. The difference was insignificant ($p > 0.05$).

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The mean BMI of patients was 26.47 ± 4.74 kg/m². Data was stratified for BMI of patients. In patients with normal BMI, 19 (25.0%) had hypomagnesemia while 57 (75.0%) had normal magnesium level. In overweight patients, 14 (25.0%) had hypomagnesemia while 42 (75.0%) had normal magnesium level. In obese patients, 5 (9.4%) had hypomagnesemia while 48 (90.6%) had normal magnesium level. The difference was insignificant ($p > 0.05$).

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CONCLUSION:

The frequency of hypomagnesemia is low but significant and can not be ignored. So early management or some preventive measures can be planned and implemented.

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